April/May 1995

Issue #44

Radio Fun

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"The beginner's guide to the exciting world of amateur radio."

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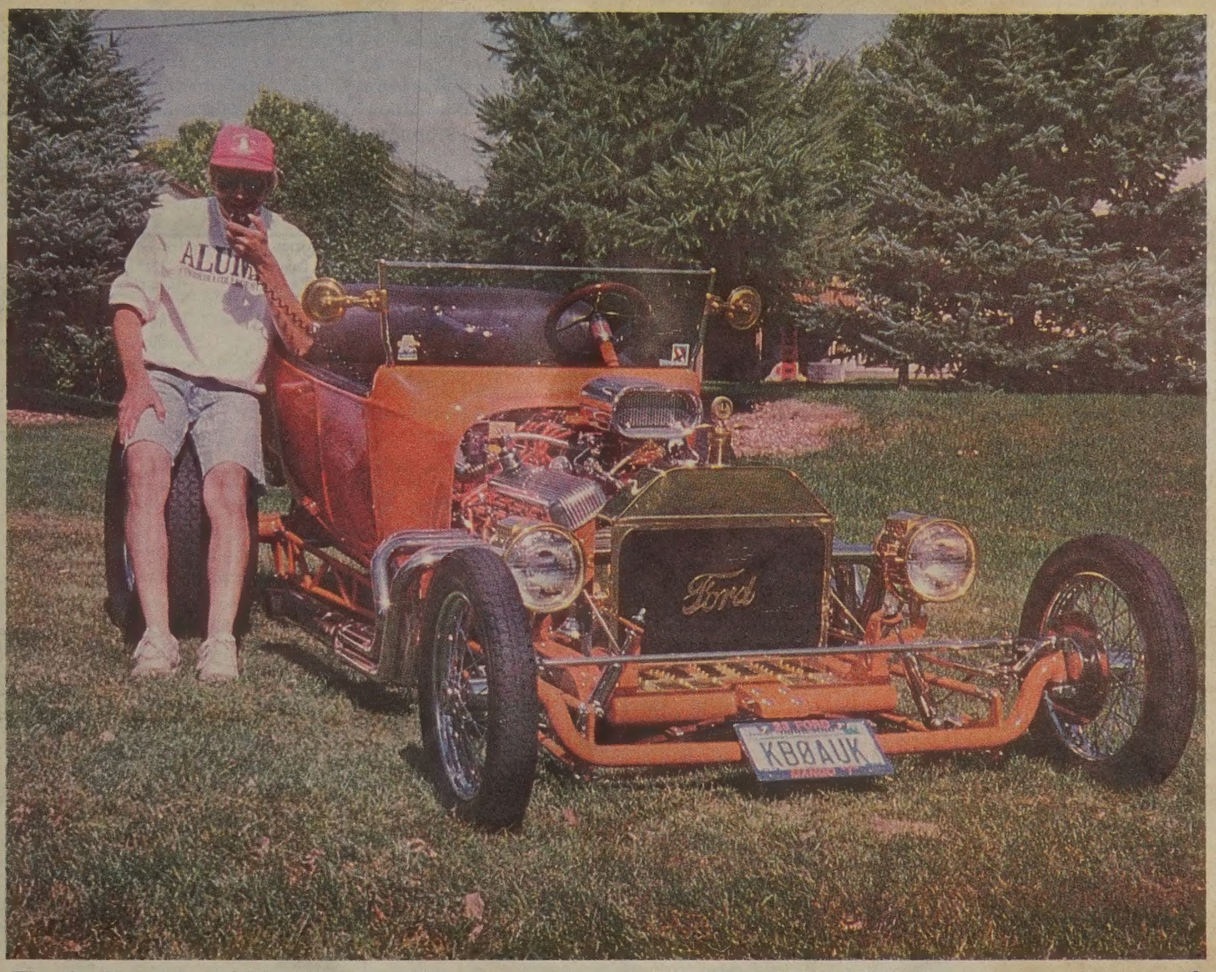
"Mobiling to the Max ..."



That's the motto of Moundsview, Minnesota, amateur Bill Clark KBØAUK. Here the proud owner of this ultimate 1923 Ford Roadster catches a few rays and some RF. He says the car gets many looks, and equally so, the ham license plates. (This month's Photo Search winning photo by Sandi Clark.)

Vanity Callsigns On The Way

On February 1, 1995, the FCC released the full text of the Report and Order covering how amateurs may obtain the callsigns of their choice. The system, outlined in last month's *Radio Fun* (page 1), consisting of four "gates," is at the heart of the Commission's plan. The full text is several pages long, and places emphasis on the fair and equitable distribution of vanity calls.

Priority is given to close relatives of deceased amateurs to obtain their old signs, followed by Extra Class, Advanced Cass, and finally, to any licensee. As expected, the fee is set at $70 for 10 years. Announcement of when you may apply for a vanity call will be made by public notice, so keep your eye on this space in the next couple of months. The system should kick in as soon as the Form 610-V is available. *TNX W5YI Report, February 15, 1995.*

FCC May Change RFI Rules

The Federal Communications Commission has proposed permitting manufacturers and suppliers of computers and computer peripherals to market their equipment without having to apply for equipment certification. The requirement for FCC approval would be dropped under ET Docket 95-19.

Currently, these devices must conform to FCC certification to ensure that they do not cause interference to radio services, including the ham bands. This certification involves specific measurement data and detailed product description to be submitted to the Commission's laboratory for review and approval.

The process can take a month or more. The industry estimates that eliminating the wait could save the computer industry some 250 million dollars per year. The FCC described the current regulations as burdensome to manufacturers and says this new procedure would align FCC requirements for personal computers with those "used successfully in other parts of the world."

The streamlined new process would be based on the manufacturer's or supplier's Declaration of Conformity. *TNX ARRL; Florida Skip, March, 1995.*

Photo Search

Shoot our next *73 Amateur Radio Today* or *Radio Fun* cover photo! Suitable subjects might be ham gear, amazing antenna arrays, or better—your own catchy ideas. We prefer color prints (from 35mm or larger formats) that are vertically oriented, sharply focused, not too "busy," and (for *73*) leave extra room at the top and left side. Send 'em to *Photo Search, Radio Fun, 70 Route 202N, Peterborough NH 03458*, with a brief description, your full name and callsign, and permission to publish. We can't return photos without an SASE. If it doesn't make the cover, we might find a spot inside. Selected photos earn you a free subscription or renewal. Good luck!

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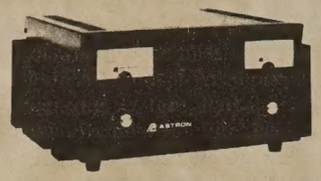

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SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models except RS-3A, RS-4A, RS-5A, RS-4L, RS-5L
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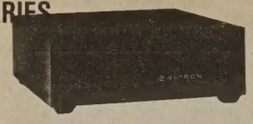
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- All units available in 220 VAC input voltage (except for SL-11A)

SL SERIES



- LOW PROFILE POWER SUPPLY

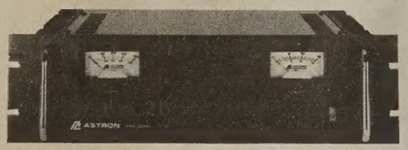
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
SL-11A	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R	•	•	7	11	2⅝ × 7 × 9¾	12
SL-11S	•	•	7	11	2⅝ × 7⅝ × 9¾	12
SL-11R-RA		•	7	11	4¾ × 7 × 9¾	13

RS-L SERIES

- POWER SUPPLIES WITH BUILT IN CIGARETTE LIGHTER RECEPTACLE

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-4L	3	4	3½ × 6⅛ × 7¼	6
RS-5L	4	5	3½ × 6⅛ × 7¼	7

RM SERIES



MODEL RM-35M

- 19" RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
RM-60A	50	55	7 × 19 × 12½	60
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50
RM-60M	50	55	7 × 19 × 12½	60

RS-A SERIES

MODEL RS-7A

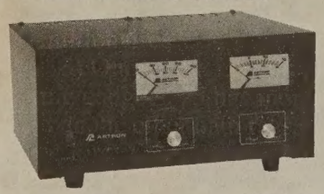
MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A		•	2.5	3	3 × 4¾ × 5¾	4
RS-4A	•	•	3	4	3¾ × 6½ × 9	5
RS-5A		•	4	5	3½ × 6⅛ × 7¼	7
RS-7A	•	•	5	7	3¾ × 6½ × 9	9
RS-7B	•	•	5	7	4 × 7½ × 10¾	10
RS-10A	•	•	7.5	10	4 × 7½ × 10¾	11
RS-12A	•	•	9	12	4½ × 8 × 9	13
RS-12B		•	9	12	4 × 7½ × 10¾	13
RS-20A	•	•	16	20	5 × 9 × 10½	18
RS-35A	•	•	25	35	5 × 11 × 11	27
RS-50A	•		37	50	6 × 13¾ × 11	46
RS-70A	•		57	70	6 × 13¾ × 12⅛	48

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46
RS-70M	57	70	6 × 13¾ × 12⅛	48

VS-M AND VRM-M SERIES



MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

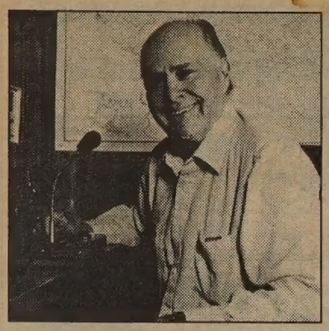
MODEL RS-12S

- Built in speaker

MODEL	Colors Gray	Colors Black	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	•	•	5	7	4 × 7½ × 10¾	10
RS-10S	•	•	7.5	10	4 × 7½ × 10¾	12
RS-12S	•	•	9	12	4½ × 8 × 9	13
RS-20S	•	•	16	20	5 × 9 × 10½	18
SL-11S	•	•	7	11	2¾ x 7⅝ x 9¾	12

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD



QLF

by Wayne Green W2NSD/1

Good News For Entrepreneurs!

The socialists in Congress are pushing to raise the minimum wage. This is indeed good news for entrepreneurs. Frankly, I hope they raise the minimum wage to at least $7.50 per hour, which is around $15,000 a year. How can a family live for much less than that these days, right?

Of course this will increase the costs for manufacturers to make produets, forcing them to either increase their prices or get rid of workers by replacing them with automation and computers. And this is where you come in.

A good rule of thumb is to multiply the cost of manufacturing a product by about six to cover the costs of distribution and marketing. Thus, any increase in workers' pay will be multiplied by six when it reaches the sales price for the product. And that will make many manufacturers no longer competitive with foreign factories, so they will either have to move their jobs to Mexico or some other lower wage country, or automate more to cut payroll.

If you spend much time on the telephone you know that more and more companies have replaced telephone operators with automated message handling systems. There are fewer and fewer jobs for low-skilled workers. And there are going to be even less.

The next time you visit a factory, take a good look at what the workers are doing. How many of them could be replaced by a computer or a computer-driven machine? Every time you can replace a worker by a machine of some kind you are going to save the company money. You'll also probably improve the quality of the product.

A worker making $15,000 a year also costs the company around $5,000 more for health care insurance, unemployment insurance, and so on. A machine doesn't come in late and leave early. It doesn't have children that get sick. It doesn't even take long weekends or have to observe holidays. No 10-minute smoking breaks every hour, either.

Companies are going to be looking for consultants who can cut their payroll, either by streamlining the work or replacing un- or semi-skilled workers with machines and computers.

This is going to come as a big surprise to the kids who are dropping out of school. McDonald's is experimenting with automated burger flippers. It won't be long before most fast food chains can be run by half as many workers or less.

For instance, suppose you could punch in your order on a keyboard by your parking place as you get out of your car? You'd put your credit card in to pay and get a card to put into a slot once inside. Your tray would come out almost immediately with your order. A similar system would work for the drive-through service. If you don't have a credit card you can pay with cash inside. But you can bet that McDonald's credit cards would be plentiful. They might even work at Wendy's, earning you prizes or future Big Macs.

Long Ago

When I first moved *73* to New Hampshire from Brooklyn in 1962, just two years after starting it, I hired a bunch of college dropout hams to come work for me. I paid $20 a week, plus room and board. I had up to eight hams living in my 40-room house and we had a great time. I cooked the meals, we put out the magazine, and we set up one heck of a ham station way up on Mt. Monadnock, a few miles away.

When I bought a small offset press we started also putting out a small VHF magazine, a contester's magazine, and one for club newsletter editors. High school kids came in after school and helped collate, staple, and address these publications for 50¢ an hour. They got some spending money. It helped keep them out of trouble. And they got to learn about the responsibilities of working.

I had one ham working with us who was so much trouble that I finally gave up and tried to fire him. He pleaded with me to let him stay and keep working without any pay. Being a sucker, I said I'd give it a try. After a couple weeks I told him he wasn't worth nothing. He then offered to pay me $20 a week if I'd let him stay.

I finally agreed to let him stay if he'd live in my house up on the mountain and help clean out the brush around the place. Just don't come down and aggravate us here. Well, for instance, I did the cooking and the live-in hams took turns washing the dishes. When it was Tedsy's turn he managed to turn a half-hour job into a four-hour job. The same when it was his job to empty the wastebaskets or shovel out the horse stalls.

Tedsy came down from the mountain one day and asked if I minded if he put up a vee beam for 6 meters, aiming it down the East Coast. What could go wrong? I said sure. The next thing I knew a few weeks later he'd cut down over a dozen big trees to make a path for the two legs of his vee beam. Worse, he'd miscalculated a bit and the beam was actually aimed at Bermuda, so no one down the coast could hear him.

I remember him walking up to me with a broken yardstick. He looked at me sheepishly and explained that he'd had it in his mouth and walked through a 30" door.

Bless The League

One day the government arrived. They'd had a complaint about my paying less than the minimum wage. I pushed them to find out where the complaint had come from and they said it was from the ARRL in Connecticut. They said I'd have to stop paying the hams with the room and board and $20 a week, pay them regular wages, and charge them for the room and board. And the after-school kids would have to get at least the minimum wage.

I automated the collating and addressing of the publications I was printing, thus getting rid of the school kids. The hams were replaced by local people doing most of the work. No more room and board. No more fun. And without the gang to keep the ham shack up on the mountain operating, I closed it down and sold the place. Well, we all had the time of our lives while it lasted. Several of my alumni have gone on to be successful entrepreneurs.

You better believe that the lobbyists in Washington from Mexico and other low-wage countries are pushing Congress hard to increase our minimum wage. Every dollar it goes up will mean millions for their countries, and more welfare and unemployment problems for us.

One alternative is to improve our school system so we'll have better educated and better skilled workers so we can compete better internationally, but here we're up against the most powerful lobbies in the country, the teachers'unions. And they're supported powerfully by the mass ignorance and apathy of voters.

Say, if we move the minimum wage up to $15 an hour we'll no longer have any poverty, right? Who could possibly be against that? If they move it to $20 I might even consider working again. RF

Newcomers

by Wayne Green W2NSD/1

This Is Your Last Copy

Well, maybe your next to the last copy, unless you are a paid subscriber. Two issues of *Radio Fun* are free—a sort of "welcome aboard" thing to newly licensed hams. If you are not yet a subscriber, I hope this will trigger you into subscribing, to both *Radio Fun* and *73*. This is a fun hobby with all kinds of interesting things to do and learn, but you need a monthly shot of excitement to keep you going.

For the price of a dinner in an average good restaurant ($30) you can get a year's worth of both publications. This will keep you up with what's going on and help you find out how to get in on the fun thousands of hams are having with the hobby, whether it be sending packet messages or going on a DXpedition to St. Pierre.

You'll also get a load of my editorials. Some people love 'em, and some hate 'em. Some hams will drive hundreds of miles to hear me give a talk at a hamfest. Others mutter unprintables and skip my stuff. My goal, both in publishing my magazines and writing my editorials, is to help you enjoy the things I'm enjoying, to educate, to open new worlds for you, to keep you from being a crummy couch potato, to get you thinking, and perhaps to help you be more successful in life.

The $30 price for both *Radio Fun* and *73* is to help get you hooked. You really should pay $39, the regular subscription price. Tell you what, if you find you're really looking forward to each issue, you can lift a tremendous load of guilt from your mind by sending me the extra $9. Or by ordering my ***Declare War*** book for $10 from Uncle Wayne's Bookshelf.

As a new ham I'm assuming that you are intelligent, interested in technology, and adventurous. This is the picture I have of you in my mind as I write my editorials and help Mike Nugent WB8GLQ, our Senior/Technical Editor, pick the articles for us to publish. Sure, we have some serious nut cases (mostly Extra Class hams, oddly enough), but 99% of my mail is from hams I wish I had the time to meet and make my friends.

You're going to enjoy the columnists I've rounded up to help you have more fun. And to learn more. No fair just rag-chewing and not learning. That's cheating. Cheating yourself most of all. It's fun learning how ham Teletype works. It's a ball building something and actually getting it to work! Wait'll you start getting some gorgeous pictures via Clover from Africa. You'll be driving your family and friends to distraction with more beautiful pictures every day from weird places around the world.

It's exciting to get a new piece of ham gear and get on the air with it, whether it's a 1-watt rig built into a matchbox, or a new kilowatt linear. My magazines run circles around the others when it comes to reviewing new equipment. Once you get to know what you are doing, I'd like to see what you can do in reviewing something you've bought. Both of my magazines are written almost 100% by the readers. Like you.

So send me a check for $30, or call in your credit card number, and let's make sure you won't miss an issue (603-924-0058). Most of the hams I entrap into subscribing keep right on for the rest of their lives. Well, what better amateur radio reference library can you have than a shelf full of *73*s? RF

Anyone (including you) can learn the Morse Code in one hour! Forget the No-Code License and get your Tech-Plus Ticket. Guarantee: You'll pass the 5 wpm code test with Uncle Wayne's system or YOU GET A 100% REFUND!

The truth is that no one using this new system has ever failed the 5 wpm code test. And it is highly unlikely that anyone ever will. We're talking about such a total no-brainer approach that many people are able to spend less than 15 minutes using this speed system before being able to ace the Novice-Technician code test.

Help your children, your wife and your friends get their ham licenses with this ultra-fast code system. Get your kids to help their friends to get their licenses. If we're going to try and keep our ham bands we need tens of thousands more hams. Millions will be even better.

Help start kids on their way toward high-tech careers by getting them hooked on hamming. The biggest obstacle to a ham license in the past has been the code. Now, with this new miracle system, this is just not even a minor problem. No longer will there be the slightest stress when taking that stupid code test that the ARRL Board of Directors has forced the FCC to continue to use as the primary method for keeping newcomers away from the hobby.

With the success of America in the next century dependent on our ability to provide high-tech career workers to deal with the information highway and the computerization of the workplace, amateur radio provides a fun way to ger kids interested in leaning about technology. It beats the heck out of Nintendo and Sega, which teach nothing. It even beats sports, which provide a good living for a handful of stars and disappointment and poverty for the losers.

We need to see radio clubs sprouting in our secondary and high schools again. We need to see hamming become a major activity in retirement homes and villages. We have room for millions of hams on our bands...of which we're using less than 0.2% today on any regular basis. Yep, that's right, 99.8% of our ham bands are just sitting there almost totally unused, with us waiting around for the FCC to sell them off and pocket the money without even a word of thanks.

How much are we charging for Uncle Wayne's One Hour Guaranteed Miracle Code Course? $5.00 postpaid. That's right, it's only five bucks! Since our charge card minimum is $7.50, maybe you should order some of Uncle Wayne's exciting adventure stories as advertised by Uncle Wayne's Bookshelf. Or send $5.00 cash or check. This will be one of the better five bucks you'll ever spend. $50 a dozen, if you like to spread joy.

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WEFAX

The avenue to personal meteorology.

by Burt Yellin K2STV

Weather is, as we all have been told and know, something that we cannot change and have absolutely no control over. But it is sure something that would be great to be able to forecast. It was upon this premise that I embarked on a journey that would allow my hobby of amateur radio to let me enter into the world of meteorology.

The first step was to get set up for weather facsimile (WEFAX) capability. I connected a FAX modem between my PC and the audio output of my HF rig, then loaded up the software that came supplied with the modem.

Getting Information

The next step was to find an HF station broadcasting the WEFAX information I sought. This became a major task, as I had an extremely difficult time finding a signal of sufficient strength for good FAX decoding. Not knowing what else to do, I called NOAA. They turned me over to the National Weather Service, which broadcasts out of Norfolk, Virginia. The personnel there were friendly and eager to help me. I now had a frequency of 8.078 MHz, or 10.863 MHz[1] and they were kind enough to send me a broadcast schedule[2] (see the sidebar).

This was really fantastic. I had sheets of paper flowing out of my printer with Northern Hemisphere satellite pictures, various millibar prognosis maps, surface pressure maps, along with 24-, 36-, 48-, 84-, and 96-hour prognosis maps. I even had a sheet with sea states, called the "NEOC SEA HT ANALYSIS." The problem was that these charts all had strange hieroglyphics, and had no meaning to me. I turned these sheets in all directions and, aside from the satellite pictures, I could not decipher what I had. Off to the library I ran, only to find that the closest thing to meteorology or weather forecasting were books on cloud interpretations. In a rage of utter frustration I ran the malls, from bookstore to bookstore, only to find more disappointment. There was nothing available on the subject of meteorology. So I turned to the National Weather Service in Norfolk again. Bull's-eye! The gentleman sent me, at no cost, everything I needed to interpret the information I had. So, without further ado, let me share some of what I have learned.

Reading the Charts

The first thing you notice on an 84-hour Prognosis Blend (Figure 1), which I find to be most useful in my area, are little flags that almost look like musical notes. See Figure 2. The "tails" point in the direction of wind flow. Each "feather" on the flag indicates 10 knots of speed, and a "half feather" indicates 5 knots. The next items to be noticed are the circles of pressure. Small circles indicate low pressure areas. The tighter the circles, the lower the pressure, and the greater the wind speed.

There is also another observation to make: In the Northern Hemisphere, the winds travel counterclockwise in a low pressure area, and clockwise in a high pressure area. Over open seas the air flow is from a high pressure area to a low pressure area. This air flow is independent of the winds contained in a pressure system, and becomes very helpful in predicting weather as it moves toward you. Also note that on land the terrain over which these fronts move alters things, but the rule of movement still is a good rule of thumb. The term Millibars (MB) is used for pressure. It is directly convertible to Inches of Mercury, which we are familiar with. As an example, 1016MB equals 30 Inches of Mercury, 1033MB equates to 30.50 inches, and 999MB equals 29.50 inches. So now we can forecast pressure and wind direction. If there is a high up in Canada and a low in the Central US, I now can say that in the near future I can expect some cold air to come down, or, in weatherese, a cooling system is coming. The men in Norfolk, however, go one step further. They mark cold fronts and warming fronts. See Figure 3. The lines with the triangular marks (a) indicate a cold front, while the semi-circular marks (b) call for a warming trend. A line with triangles and semi-circles indicates a stationary front (c). The surface pressure maps indicate the lines of equal pressure at a given altitude. These lines are called isobars and, again, the closer they are, the stronger the winds. The various MB charts relate to the pressures at varying altitudes above sea level. Not only do you get the pressure variations at the different altitudes, but you also get the wind velocities and direction. When you get real good at this you can nail some solid forecasts.

You can capture some information early in the day, and then compare it to that obtained later on. By marking the changes in informa-

Continued on page 7

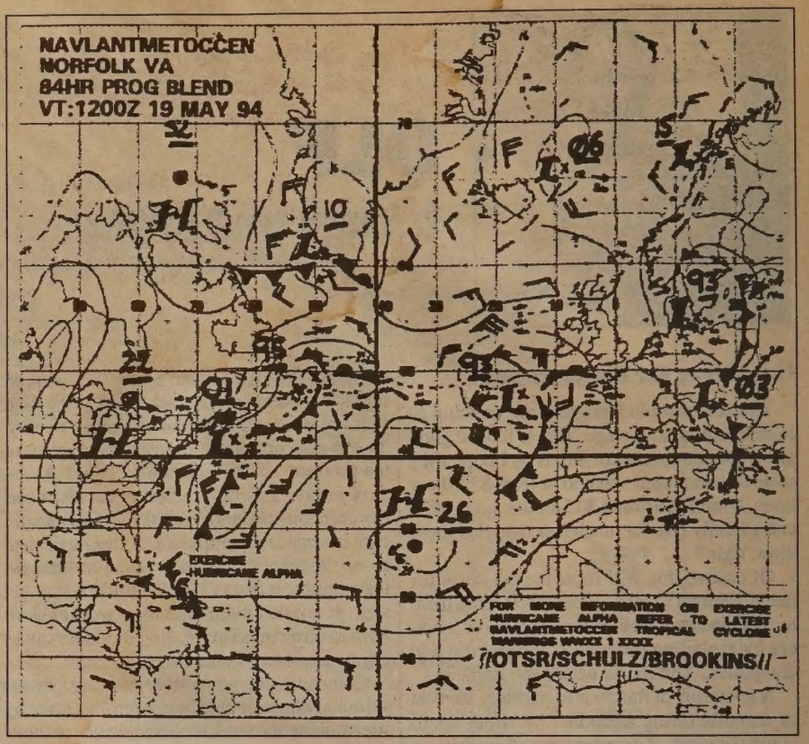

Figure 1. 84-hour prognosis blend.

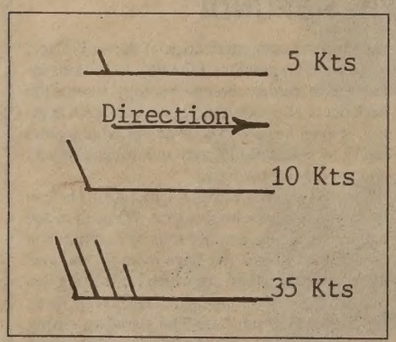

Figure 2. Symbols denoting wind speed and direction.

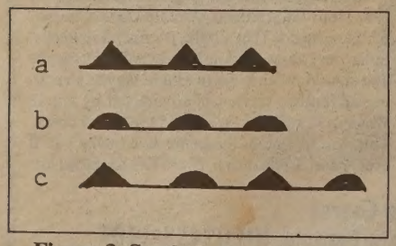

Figure 3. Symbols denoting wind speed and direction.

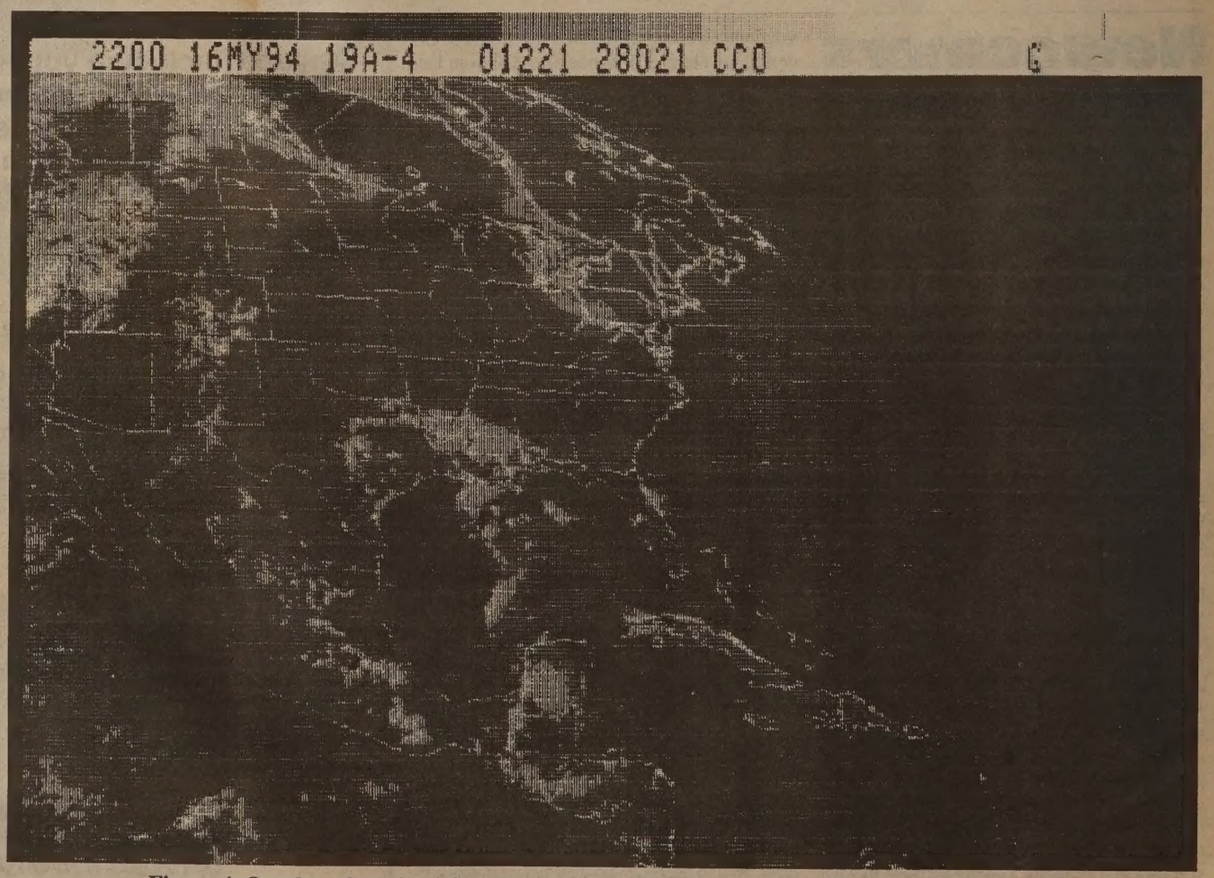

Figure 4. Overlay of territorial outlines on a satellite picture of the Northern Hemisphere.

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letters

**Write to: Radio Fun Letters
70 Route 202-N,
Peterborough, NH 03458**

[Editor's Note: Last December we received a request for a donated subscription from Robert Hazard N6NBF, instructor at the John F. Kennedy High School in Granada Hills, California. The school was devastated by the January 1994 earthquake and, as a member of the school's Ham Radio Team, he hoped that a subscription would encourage students to return to school and help them recover from the trauma. His "thank you" note follows.]

Robert Hazard N6NBF, Granada Hills CA Thank you very much for the subscriptions to *73* and *Radio Fun* for the Kennedy High School Technology Program and Ham Radio Team. We have five members on the Team and hope to have more in the near future. Because of the earthquake our school district has realized the importance of reliable communications here in earthquake country and is putting energy and *money* into ham radio and radio equipment. I will be sure to talk up *73* and *Radio Fun* and encourage as many subscribers as I can. I can assure you that much learning will take place because of your donation, and students, along with adults, will be reading a quality magazine. You have put much excitement into our school and helped us on the road to recovery from the recent earthquake.

Glenn A. French II N2WEA, Oakland Park FL My thanks to friends who give me their old copies of *73* and *Radio Fun*. I spend much enjoyable reading time with these magazines.

One of the more enjoyable aspects of ham radio, for me, has been the wealth of knowledge and friendship I've obtained from amateurs affectionately known as old-timers. One of these old-timers, who I talk with on occasion, reminisces about the days when the "Great Depression" made this hobby financially real tough to enjoy. During the Depression money was hard enough to come by just for food, shelter and clothing. My friend, in those days, built all of his own equipment. He even made his own vacuum tubes to help defer cost.

In this day and age money is not as hard to come by as it was during the Depression. However, someone forgot that amateur radio is a hobby and supposed to be fun. It's becoming an expensive, competitive business. I hear talk all the time about attracting young people to our king of hobbies. Nowadays it seems to take a king's ransom to even think about getting into amateur radio. Even the least expensive new equipment and a few basic accessories will cost the newcomer a thousand dollars or more, if you listen to the experts. If a young person is interested in ham radio and can afford a grand or more, that's great. However, most young people that I know with an extra thousand dollars need it either for their education or for a down payment on their first car.

Let's turn the tables and stop making this out to be a hobby that can only be enjoyed by the wealthy. I've found amateur radio to be a low-cost endeavor and finding ways to keep the cost down has made it more fun. I'd like to discuss my $85 station, what the so-called experts said, and the truth of the matter. Everyone won't get as lucky as I did, but if they're willing to try, anyone can come close.

When I upgraded my ticket to Tech-Plus I went to a friend's house, and while I was there my friend was using his new $7,000 rig, $600 antenna and about $2,000 worth of accessories (a nice $10,000 station). I asked my friend (one of the so-called experts) what I needed and what it might cost for me to get started HF DXing. After talking to him I almost decided that amateur radio was too expensive for me. The problem is, when the DX bug bites, it doesn't let me go.

When you need to know something, don't go to the pros, go to the old-timers. The experts made it sound like I had two choices: feed my family and pay my bills, or enjoy my hobby. I chose to do both. The experts told me about all the bells, whistles, knobs and gadgets I would need just to get started. I remembered my friend, the old-timer mentioned above, and how he told me he had gotten started on five bucks. I went to Leo and asked his advice on getting started on a low, low budget. His help got me started for under $100.

Leo's first suggestion was to forget everything those idiot experts had told me. Next, ask myself, "What do I want to do with a radio?" I came up with all this crap about about promoting good will and enhancing my communication and technical skills. Leo pointed out that what any ham really wants is to transmit and receive messages and enjoy the hobby. Leo was right, that's exactly what I wanted to do with my radio.

It was time to start looking for a rig that fit my budget. Flea markets, *Ham Traders* magazines, and electronic and ham radio equipment stores were all good places to look. I found just what I was looking for on a 2 meter traders' net on one of the local repeaters. There it was, a Tempo One, asking price $75. Leo checked it out for me and it was working just fine. Now the experts started calling with such comments as: "Boat anchor," "Tubes suck," "You'll be lucky if you work some locals with it," etc. . . .

Well, I took Leo's advice; I didn't listen to the experts anymore. I picked up a mike for $5 at a hamfest, and some scrap coax and connectors for $5. A friend gave me an Antron 99 vertical antenna and loaned me his SWR meter. I don't have all the bells, whistles, knobs and gadgets, but I'm on the air for $85 and enjoying every minute.

Not everyone will find the great deals that I did, and not everyone is willing to take a risk on older used equipment. The idea is to have fun, not to try to break the bank. How do you enjoy ham radio if you're working all the time to make enough money to afford the equipment?

My $85 station has been on the air for two months, running between 50 and 100 watts, SSB, and 10 meters (the dead band). I have worked 36 states, 22 countries, four continents and 18 DX zones, and have collected over 100 10-X numbers. I'm doing what I wanted to do—making contacts and having fun doing it.

Glenn—Ham gear is cheaper than ever these days. Hey, I was there, so don't pull that old baloney about today's rigs being expensive. In the 1930s the cheapest bunch of junk on the market was the Hallicrafters Sky Buddy receiver. It sold for $19.50. Sounds cheap, right? Well, ice cream cones were a nickel then and what today? My recent cones have been close to $2! A nickel subway ride is up around $1.25. And that puts the cost of a five-tube junker radio at around $400 in today's dollarettes (Eisenhower's term). I paid around $90 for my Skyrider Defiant in 1938. That's $1,500 today for a receiver that drifted all over the place and had none of today's bells and whistles. But you're right about one thing, shopping the classifieds and flea markets can get you some marvelous bargains. There are tens of thousands of old rigs moldering away in attics, cellars, garages, and on ham shack shelves which should be resurrected and made available for the impecunious and thrifty. A hobby for the wealthy? Pfaugh. When I got out of college I made 90 cents an hour as the chief engineer and announcer at a kilowatt broadcast station (WEEB), but I managed to put together a pretty darned good ham station. I had a couple kilowatt AM rigs—one I'd built and the other I bought from a ham. That was a revamped pre-war National 600 rig with a pair of 203Zs in the final and one heck of a kick. It cost me around $200, but it was worth it, even in 1946 dollars. A month's pay . . . Wayne RF

Bright Future

If you've been procrastinating about upgrading your license class, this will make you really feel like a loser. Pictured on this page is *nine-year-old* Samantha Sanford AA3JS. Samantha passed her Novice exam at age eight on May 3, 1994, gave up TV for the summer and fall, then passed her Extra exam on December 21, 1994, just eight months later!

Samantha enjoys making new friends on CW and SSB, and she loves to rag-chew with all the local club members of the South Hills Amateur Radio Club, of which she was voted Junior Select Person for the 1995 term. She is often the net controller for the weekly 2 meter net. She has also been active in Field Day activities and has set up a ham radio exhibit at her elementary school.

Samantha aspires toward the science or engineering disciplines, sparked by her involvement in amateur radio. She offers the following advice for those thinking about taking an amateur radio exam: Study, study, study; practice, practice, practice; then have fun, fun, fun! *TNX Robert Sanford AA3FI.*

Photo A. Samantha L. Sanford AA3JS (age 9).

Designing an Electronic Switch

A test stand for the non-engineer ham.

by Ken Lowrey KF8BC

When my long-awaited AL-80B linear finally arrived, I eagerly read the manual, plugged in all the cables, and began enjoying my new piece of equipment. Unfortunately, I quickly discovered that the internal transmit/receive (TR) relay in my IC-751A transceiver failed due to the high current requirement of the AL-80B relay. As a matter of fact, the internal relay in the IC-751A lasted for only a few QSOs. While replacement of the relay would not be difficult, it would also not solve the problem because, like the original, it was not rated for the job I needed it to perform.

An alternative would be to use the internal TR relay in the IC-751A to switch an outboard relay with a higher current capacity, which would, in turn, switch the AL-80B into the transmit mode. I disliked this method, because using a relay to switch another relay which switched a third relay seemed to be redundant and very cumbersome, not to mention the fact that all these mechanical relays were old technology. Since I was using modern equipment, I wanted to use modern methods for my TR switching arrangements. I needed an electronic switch, but the question was, how could I build such an animal?

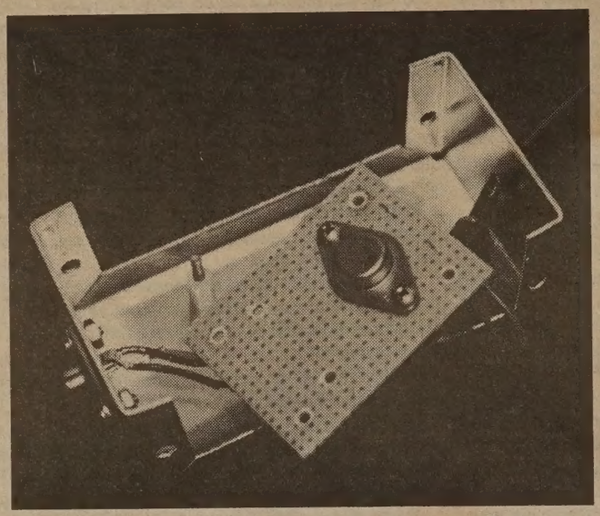

Photo A. The T/R switch was built from the junk box and from components salvaged from previous projects; note the unused holes in the perf board. Who says the finished product has to look professional? After all, it is *amateur* radio.

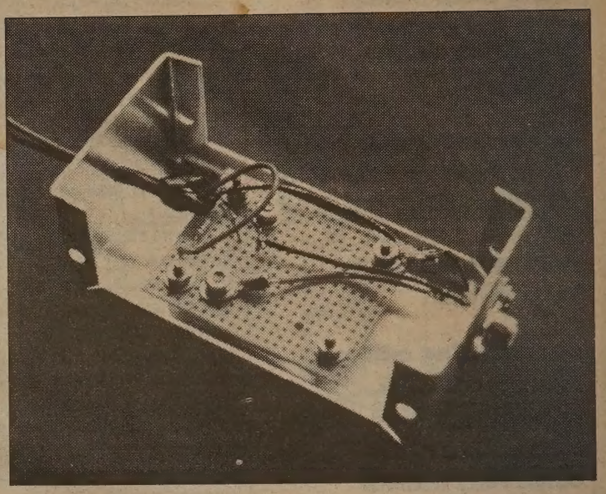

Photo B. The switch was enclosed in a mini-box with room to spare. Note how few components are necessary! The two wires bring 8 volts and ground from the accessory socket on the rear of the IC-751A transceiver. A cable is plugged into the RCA jack and connected to the AL-80B linear amplifier.

The TR Switching Possibility

I explained my problem to my friend Bill KG5AR, who recommended that I read about the TR method outlined by Dean Jeutter ("Hints and Kinks: Silent Full Break In Transceiver TR Switching for the Alpha 87A," *QST*, Volume LXXVIII, No. 7, July 1994, pp. 80-81.) I promptly read the article. Dean's transceiver generated an internal voltage which was connected to the accessory socket, and was switched on during transmit and off during receive. He used this as a control voltage to drive a MOSFET which switched his linear electronically! Excellent idea.

But, when I attempted to adapt his idea to my rig, I ran into several problems. First, Dean had built his switch for a Kenwood TS-850S and an Alpha 87A. Dean had 12 volts DC available from the accessory socket of his Kenwood, but my IC-751A had only 8 DC volts of switched output. Secondly, he specified a Siliconix Si9955 dual MOSFET in his circuit; this device was conspicuously absent from my junk box, was not mentioned in any of my parts catalogs (obviously I do not have an extensive collection of parts catalogs), and was not listed in the cross-reference manuals at my local Radio Shack store. Not only would I have to modify his circuit in order to use a different voltage, but I would also have to use a different solid-state device. Further complicating the problem, according to the Icom owner's manual, the 8-volt DC output at the IC-751A's accessory socket was limited to 5 miliamps of current. All of us are very aware that there are several types and brands of transceivers and linear amplifiers out there, and the number of different combinations of equipment is quite high. Therefore, the chances of a generic electronic TR switch satisfying all these operating combinations is rather remote. How can one custom-design an electronic switch to fit any combination of exciter and amplifier? This is, I believe, a problem for lots of hams, because the probability is high that your equipment will not be the same as either Dean's or mine. Read on. A solution to your problem is not far away!

> ***"How can one custom-design an electronic switch to fit any combination of exciter and amplifier?"***

Try a Custom Design

I am not an engineer, so circuit design is not one of my strengths. But I needed an electronic switch, so I decided to set up a test stand to redesign Dean's circuit for my use. I used the circuit shown in Figure 1 to test the actual switching conditions of the semiconductors in my junk box. I would determine the component values of the circuit not by engineering the design before construction, but by testing the parts and actually making the circuit operational. I was not too worried about "smoking" small components because the voltage and currents were reasonably low, and because I was using components from my junk box. And, even though I tested all of my transistors except for some very small low current capacity plastic case devices, none of them were destroyed.

There were several criteria which were required to adapt the electronic switch for my application. First, the device must be an NPN device. A MOSFET would be nice, but any transistor capable of handling the required power with a low internal resistance would work. Some of my junk box transistors did not have any markings on them, and others had numbers which were useless in device identification, but I tested all of the unknown devices in my junk box, along with my known NPN transistors, MOSFETS or not.

The second criterion was that the transistor must switch with 8 volts or less, predetermined by the voltage available at the accessory plug at the rear of my transceiver. I did not want to subject my transceiver to possible abuse by using the 8-volt accessory output for the tests so I used a 9-volt battery in the test station. The battery I used was a reject from a smoke alarm and put out only 8 volts, which was perfect for my tests.

Third, the device must use less than 5

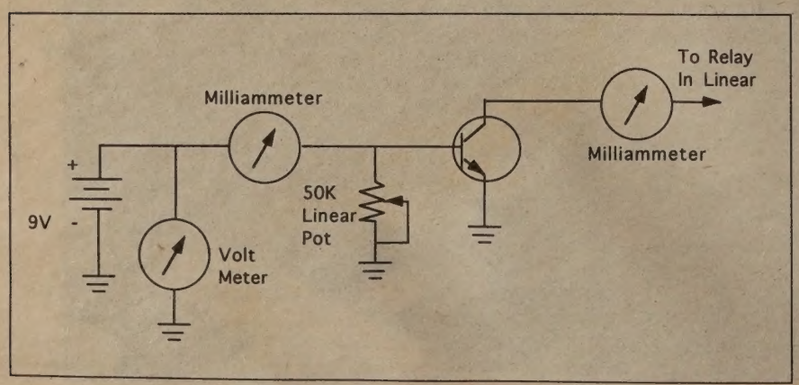

Figure 1. Test-stand circuit.

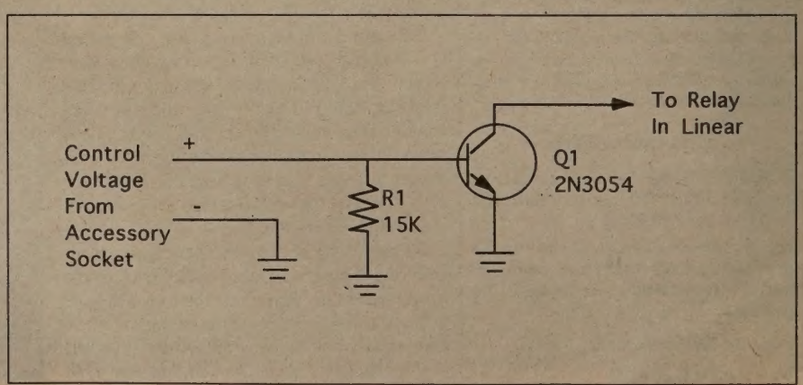

Figure 2. Final circuit.

mils of current. I inserted a potentiometer in the circuit so I could vary the power required to switch the current flow through the transistor. During the actual test itself, I could read the required input switching potential on the voltmeter while I monitored the amount of power necessary to actually switch the transistor on the milliammeter.

The fourth criterion was that the transistor must be able to withstand the 100 mil current requirement of the AL-80B. During the test, I listened to the relay in the linear when I closed Switch 1 in the test stand. After I found a device which would switch using only 8 volts and 5 (or fewer mils), I measured the current flowing from the AL-80B's relay through the transistor under test, and compared this to the approximate 100 mA which the AL-80B requires in its relay circuit.

Some devices failed to switch. Others switched, but used more than 5 mils of current. I found several which would be satisfactory, but selected a 2N3054 silicon power transistor for the final version of my project. It switched with 0.8 milliamperes, and it switched virtually all of the AL-80B's relay current; it could never switch all of the current due to internal resistance of the transistor, but it switched enough to pull the linear's relay closed. Then I looked up the specifications for the 2N3054 and found that it was rated at 5 watts without a heat sink, well within my operating requirements of 1.2 watts. (The power dissipated by the 2N3054 is 1.2 watts, because the AL-80B's relay circuit requires 100 mA at 12 volts, or 12 x 0.1 = 1.2 watts.)

In order to assemble the final electronic TR switch, I measured the resistance across the test-stand potentiometer, which was required to reduce input current to 0.8 mA, and used a similar fixed value for R1 in the final construction. In my case, this resistance value was 15k ohms. The resistor and transistor were mounted on a perforated board and point-to-point wiring was used. The perf board was then mounted in a small aluminum box. Connections to the IC-751A's power source were wired through a plug which matched the accessory socket. A shielded cable connected the electronic switch to the AL-80B's relay. I made no attempt to miniaturize the final version of my electronic switch because I have short, fat fingers and miniaturizing is frustrating for me, but the circuit lends itself to miniaturization if you prefer.

The schematic of my final version is shown in Figure 2. If you set up a similar test stand, your choice of a switching transistor will probably be different, and therefore your circuit resistance values will probably be different also, but the circuit will be the same.

Both the testing and the construction of the final project are fairly simple, but there are several items worth noting. First, Dean's circuit was used for QSK operation, and he thoughtfully informs us of this fact. However, *the AL-80B is not QSK-compatible, and your linear may not be either,* so use caution. I use push-to-talk on SSB, and I use a slightly longer delay time when operating CW so the relay in the AL-80B is not overworked. The slightly longer hang time is desirable because the switch is fast enough to be operated QSK and will therefore switch a great deal faster than the AL-80B's internal mechanical relay.

I am happy to say that my electronic switch works very well. During this project I looked at a lot of transistor specifications, and as a result I learned a lot about transistors and their electronic characteristics. Experimenting with electronics does not have to include a complex circuit to be fun and rewarding. You can set up your own test stand and build your own electronic switch. Alligator clips soldered to short lengths of wire work very well for the experiments. And, as always, safety comes first, so remember to use a non-conductive work surface, like a wood bench or glass desktop for your experiments. RF

WEFAX

Continued from page 4

tion as well as knowing the time element in between, you can now plot the fronts as they come your way.

This information is basic, but along with the satellite pictures, you can forecast the oncoming weather with a very good degree of accuracy, and up to 72 hours in advance. Just a fast note: Not only do you get satellite pictures of the Northern Hemisphere, but the continental outlines are placed in, with states and countries (see Figure 4). This is a step beyond obtaining the WEFAX information off a satellite directly and having to fill in the land masses yourself.

The above should provide a good start into weather forecasting. The FAX data along with a large picture window in your shack should be all you'll need. RF

Notes:

1. Although the frequencies on the Broadcast Schedule are listed as 8.080 MHz and 10.865 MHz respectively, they are received at 8.078 MHz and 10.863 MHz, both USB.

2. The Naval Facsimile Broadcast Schedule in the sidebar was obtained from NOAA, Norfolk International Airport, Norfolk VA 23518.

Bibliography:

1. *How to Use Radiofacsimile Weather Maps,* by Kenneth E. Lilly, Jr., Furuno U.S.A., Inc., P.O. Box 2343, 271 Harbor Way, South San Francisco CA 94080.

2. *Mariners Weather Log,* $12 per year, available from Superintendent of Documents, P.O. Box 371954, Pittsburgh PA 15250-7954.

The above two items were sent to me as a result of my contact with NOAA, Norfolk VA.

Naval Facsimile Broadcast Schedule, Effective 19 January 1994
Naval Atlantic Meteorology and Oceanography Center Norfolk VA

Time (Z)		V.T.
0000/1200	NFAX SCHEDULE	
0015/1215	SAT PIC	
0030/1230	NOGAPS 200MB 48HR PROG	12/00
0040/1240	NOGAPS SFC PRES 72HR PROG	12/00
0050/1250	NOGAPS 500MB 72HR PROG	12/00
0100	NMC SFC PRES 72HR PROG	12
/1300	NOGAPS SFC PRES 96HR PROG	/00
0110/1310	OPEN PERIOD	
0115/1315	SAT PIC	
0130	NMC 500MB 72HR PROG	12
/1330	NOGAPS 500MB 96HR PROG	/00
0140	NMC SFC PRES 96HR PROG	12
/1340	NOGAPS SFC PRES 120HR PROG	/00
0150	NMC 500MB 96HR PROG	12
/1350	NOGAPS 500MB 120HR PROG	/00
0200	NMC SFC PRES 120HR PROG	12
/1400	NORAPS SFC PRES ANAL	/00
0210/1410	OPEN PERIOD	
0215/1415	SAT PIC	
0230/1430	OPEN PERIOD	
0240	NMC 500MB 120HR PROG	12
/1440	NORAPS 500MB ANAL	/00
0250/1450	NORAPS SFC PRES 12HR PROG	12/00
0300/1500	NORAPS 500MB 12HR PROG	12/00
0310/1510	OPEN PERIOD	
0315	NEOC SST ANAL	
/1515	FNOC SST ANAL	/00
0330	NMC EXTENDED SFC U/A PROG	
/1530	OPEN PERIOD	
0345/1545	OPEN PERIOD	
0400/1600	NORAPS SFC PRES 24HR PROG	12/00
0410/1610	OPEN PERIOD	
0415/1615	SAT PIC	
0430/1630	NORAPS 500MB 24HR PROG	12/00
0440/1640	NORAPS SFC PRES 36HR PROG	12/00
0450/1650	NORAPS 500MB 36HR PROG	12/00
0500/1700	NMC NGM 24HR PROG	00/12
0510/1710	OPEN PERIOD	
0515/1715	NEOC 36HR BLEND	12/00
0530/1730	RAFC SIG WX 12HR PROG (FL250-600)	12/00
0540/1740	NMC 36HR 500MB HT/ISOTACH PROG	00/12
0550/1750	NMC 48HR PROG	00/12
0605/1805	OPEN PERIOD	
0615	SAT PIC	
/1815	NEOC SEA HT ANAL	
0630/1830	NOGAPS SFC PRES ANAL	00/12
0640/1840	NOGAPS 850MB ANAL	00/12
0650/1850	NOGAPS 700MB ANAL	00/12
0700/1900	NOGAPS 500MB ANAL	00/12
0710/1910	OPEN PERIOD	
0715/1915	SAT PIC	
0730/1930	NOGAPS 300MB ANAL	00/12
0740/1940	NOGAPS 200MB ANAL	00/12
0750/1950	NOGAPS SFC PRES 24HR PROG	00/12
0800/2000	NOGAPS 850MB 24HR PROG	00/12
0810/2010	OPEN PERIOD	00/12
0815/2015	SAT PIC	
0830/2030	NMC 24HR SIG WX	00/12
0840/2040	NMC 36/48HR SIG WX	
0850/2050	NOGAPS 700MB 24HR PROG	00/12
0900/2100	NOGAPS 500MB 24HR PROG	00/12
0910/2110	OPEN PERIOD	
0915/2115	SAT PIC	
0930/2130	OPEN PERIOD	
0945	OPEN PERIOD	
/2145	NEOC 84HR PROG BLEND	/00
1000/2200	NEOC HIGH WIND/SEAS WARNING	
1015/2215	SAT PIC	
1030/2230	NOGAPS 300MB 24HR PROG	00/12
1040/2240	NOGAPS 200MB 24HR PROG	00/12
1050/2250	NOGAPS SFC PRES 48HR PROG	00/12
1100/2300	NOGAPS 850MB 48HR PROG	00/12
1115/2315	SAT PIC	
1130/2330	NOGAPS 700MB 48HR PROG	00/12
1140/2340	NOGAPS 500MB 48HR PROG	00/12
1150/2350	NOGAPS 300MB 48HR PROG	00/12

LOCATION	FREQS	TIME
CUTLER,ME	3357	00Z-12Z
	10865	12Z-00Z
	8080	ON CALL
	15959	VIA
	20015	COMMSPOT

LOCATION	FREQS	TIMES
ICELAND	9318	CONTINOUS
	3820.5	ON CALL VIA
	18486	COMMSPOT

RF kit review

TechnoLogic Concepts
1803 Mission St., Suite 308
Santa Cruz CA 95060
Price Class: $39.95 plus $2 S&H

TechnoLogic Concepts' X1C Direct Frequency Entry Kit

by Ray Wendell NØRAA

This Ramsey FX-146 add-on kit provides not only a functional solution to the frequency selection limitation of the Ramsey rig, but also an opportunity to develop home-brew skills you may not have known you had.

Throughout my 25-plus years of kit building, two memories stand out the most prominently. The first was when, at about age eight, I reassembled the parts from my crystal radio kit to see if I could do it without the instructions. I'll never forget the thrill when I connected the ground wire to our rotary telephone dial-stop (try doing that today—the # key just isn't the same) and, after some tense tuning moments, heard a nearby AM station.

The second experience was about two years ago. After several weeks of work, I made my first ham radio contact (to my neighbor Dave K7RH) on my just-finished Ramsey FX-146 2 meter transceiver. Hours of soldering, trimming, decimal-to-binary digit conversion, diode matrix bridge construction, testing, and calibration culminated in all of a 5-foot contact (Dave was in my shack with his HT). While the sense of satisfaction was tremendous, I began to realize that there was a problem, particularly since my family and I go traveling in a camper. The thought of trying to a) identify the repeater frequencies in our destination areas, and b) re-solder the diode matrix appropriate for that frequency every time we went away for the weekend made me conclude that mobile use was probably not in the cards. (Unless we only traveled to locations that happened to be served by repeaters with the same frequencies. Actually, that might be interesting!)

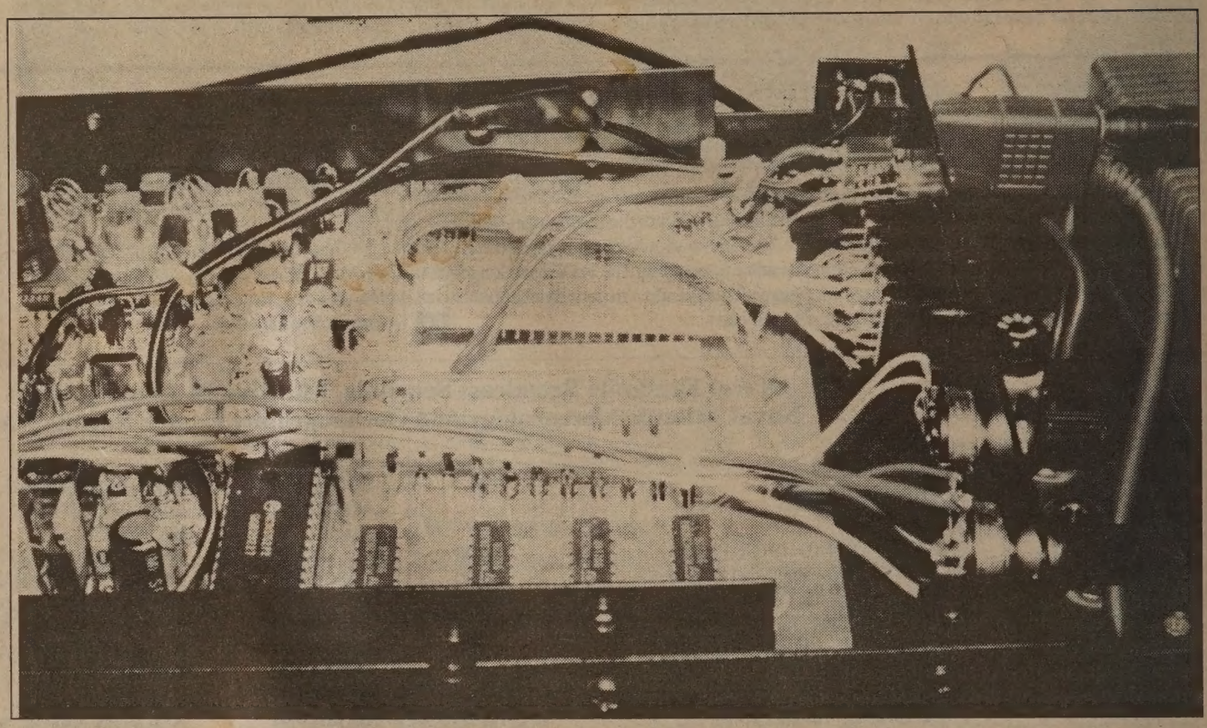

Photo A. The X1C board, showing the "socket and header" solution.

The Kit

I came across a *73* article which described an option for direct frequency selection, but felt that the construction was a bit beyond my skill level at the time. The solution, however, seemed to present itself when I came upon the TechnoLogic Concepts X1C Direct Frequency Entry kit. The sales material promised that all I needed to do was "add a few parts and five BCD thumbwheel switches" and I would have continuous coverage. That, and $39.95 plus $2 S&H, and I would be in business. With great anticipation, I sent away for the kit.

While I wasn't expecting Ramsey-style, step-by-step instructions, my previous experiences had led me to expect somewhat more than I received. The 5" x 8" package contained a small, pre-assembled PCB with two EPROMs, two resistor packs, and one capacitor attached. The whole assembly comes wrapped in aluminum foil, and caused my daughter to ask if she could have half (it did look remarkably like a small Hershey bar). The instructions consisted of an entire two pages. I was not in Kansas anymore.

My first reaction was that I had not received all the parts. It took me about a week to crack the code on the parts list: Unless the part was followed by the word "included," *it wasn't included.* Luckily, I knew what "Digi-Key" meant, so I was able to look up, and order, the five BCD thumbwheel switches, along with the right and left mattes. Alas, another two weeks and $20 added to the project.

Construction

When the remaining parts arrived, I was able to start in earnest. The first step in the instructions called for me to "remove all diodes" in my Ramsey FX-146 frequency selection matrix. Agony! Thoughts of late nights spent hand-crafting bus wires into the diode bridges flashed through my mind as I heard the grinding sound of wire cutters disintegrating the glass diode shells. This is probably why surgeons do not operate on family members.

With that painful step out of the way, I was ready to move on. "Create a wiring harness from the EPROM board to the thumbwheel switches." Hummm. Five switches, five pins each, 25 solder connections in the space of a large pack of gum. TechnoLogic also recommends using pre-tinned, stranded wire for the harness. Have you ever tried to find 24-gauge, stranded wire? After several blank looks from the "We've Got Answers" people at Radio Shack, I gave up on any notion of a socket-type harness, and just started soldering the only 24-gauge stranded wire I could find—speaker wire. The schematic pinout was fairly easy to follow and I ultimately ended up with a functional, if inelegant, wiring harness. I was also able to cut a reasonably straight thumbwheel mounting hole in the front of my FX-146, even without the benefit of a template.

I decided to go out of sequence and mount the TechnoLogic board inside the FX-146 next. The manual suggests using "sockets and headers." Another foreign concept at my local Tandy outlet. After a fair amount of head scratching and eyeballing miscellaneous parts, I finally resorted to using a 20-SIP socket with four pins cut off, and 16 1/4" pieces of 24-gauge solid wire for the headers. Again, another functional solution. By now I was starting to feel pretty darn resourceful.

The next step was to test the voltages at the EPROM address lines: +3.5V indicates a value of "1," and no voltage equals a value of "0." This was a good-news/bad-news situation for me. The good news was that I was receiving no voltage where none should be; the bad news, I only had a maximum of +2.0V for the "1" values. More head scratching and much double-checking of wiring later, I decided that the important thing was that the "0"s and "1"s were in the right places, so I declared victory and moved along. (As it turned out, my Heathkit Regulated Power Supply was not delivering sufficient current to the circuit).

Next came the offset step. The kit offers five different offset options: 1) simplex only in or out of the 2 meter band; 2) automatic offset; 3) an SPST toggle between (1) and (2); 4) an SPDT toggle between simplex, + offset, or - offset; and 5) a five-position rotary switch that allows you to choose any of the above. I selected option (4). It offers a great degree of flexibility, but has one drawback—I have to remember to manually select the offset (my initial failure to do so resulted in extreme anxiety when I first started using the upgraded rig. I couldn't trip my local repeater, and was convinced that I had turned my hand-crafted pride and joy into a small boat anchor).

Operation

Operation is simple—dial in the desired frequency, select the offset, and you're on the air! Initial contacts I had indicate that the selected frequency is within +/- 1 kHz of the actual frequency. I hope to narrow this with further alignment. I have now eliminated the biggest drawback to the original Ramsey design—direct

frequency entry. I don't have to re-solder the diode matrix any time I want to change frequencies, and therefore have the full mobile use I originally wanted. Success!

People have told me that, given the time and money I have put into the original kit, the narrowband filter (to eliminate intermod—another story), and now the direct frequency entry upgrade, I could have found any number of used 2 meter rigs at a hamfest or swap meet, saved myself a lot of work, and ended up with a better performing setup. That may be true, but the way I look at it, it's like exercise—it may not always be pleasant while you're doing it, but you are better off for having made the effort. I have both function and performance on par with factory-built rigs, *and* the pride and satisfaction of building my own equipment. Frankly, I think I'm coming out ahead. RF

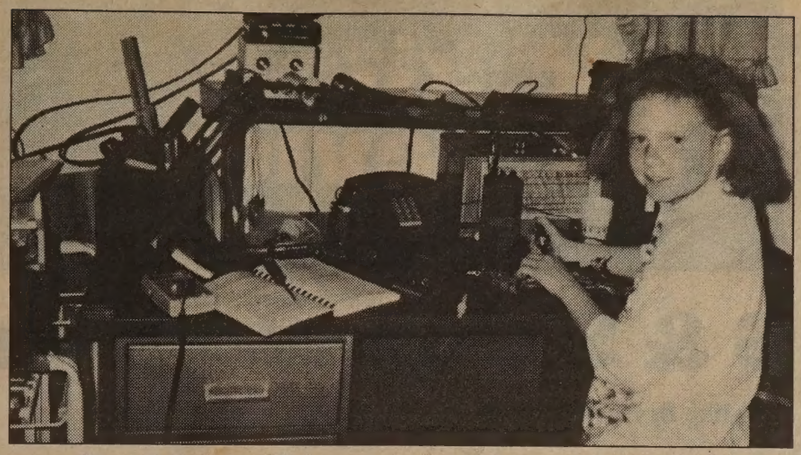

Photo B. Daughter Kristina helps out with assembly of the X1C.

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Two Lakeview 2 Meter Mobile Antennas

by Jeff M. Gold AC4HF

Hams are always looking for bargains. Sometimes you can get one with new equipment and don't have to spend hours searching through hamfests. I recently tested out two different types of 2 meter mobile antennas. Both are from the Lakeview Co., the people who manufacture Ham Stick HF mobile antennas and the Carolina Bug Katcher. I have been very pleased with their products and decided to test out two of their 2 meter mobile antennas. Both of these antennas can be installed in minutes, are made of excellent materials, and need no tuning.

The OTG-2

The first antenna I tested was an On The Glass mount antenna (Model OTG-2). The antenna works on capacitive coupling and the windscreen glass acts as the capacitor's dielectric.

I have a convertible that I like to drive whenever the weather is nice. I had no convenient place for a magnetic mount or other type of 2 meter antenna. I had been using a magnetic mount on the front hood and was not happy about the way it looked or about having to move the mount to get to the car's engine.

This antenna is rated at 60 watts with a 3 dB gain. It comes with all mounting hardware, including RG-58 coax and connectors, and is only 27-1/2" tall. The antenna is black and pretty attractive to look at. It comes with one page of simple-to-follow instructions. There are only a couple of things to remember when installing the antenna; you can have it operational in a matter of minutes.

The first decision is where you are going to put the antenna. The best location for mounting the antenna is at the top center of the rear window or windshield. With my convertible, that leaves the front windshield. The coupler box, which is what will be mounted on the glass, needs to be 1/2" or more away from the edge of the window. You should pay careful attention to the instructions. They state clearly to make sure the antenna doesn't obstruct your view, and that the windshield wipers will clear it. You also can't mount the box over your defogger wires and should avoid mounting on shaded or metallic glass. I have read of some cases where people claimed this type of antenna wouldn't work properly. Heavily-tinted glass can cause problems. Mine is mounted on lightly-tinted glass and works great, but that doesn't mean it will work well in every case. The temperature when you are installing the antenna needs to be between 60-100 degrees Fahrenheit.

Once you have picked a good place to mount the antenna, you take the supplied alcohol swab and clean both the outside and inside window where you will be mounting the antenna. I used regular glass cleaner before using the alcohol swab. To mount the antenna you only need to peel off the tape on the coupling box, then press it to the window and hold it there for a minute. Be careful to get it right the first time—once you stick the antenna to the glass it is very hard to get it off and you will need new mounting material.

When the antenna is successfully mounted on the glass you just adjust the whip part to be at about a 90-degree angle from the vehicle body for best performance. You next attach the coax and route to the rig. There is a tuning capacitor built into the coupler box and a plastic tuning tool is provided. You should check the SWR of any antenna installation if at all possible. I borrowed a 2 meter SWR meter and checked the installation. The SWR was pretty flat, with the worst measured SWR at 1.3:1 at 145.00 MHz. Most of the rest of the band was 1.1:1. These measurements were done without having done any tuning. I decided I couldn't beat the way it came from the factory and have left it alone. I find the antenna performs great. The antenna is made of very good materials and is well worth the $32.95 price.

The #M-300

The second Lakeview 2 meter antenna I tested is their #M-300 magnetic mount half-wave mobile antenna. This model is also made of very good materials. It has a very stiff stainless steel whip, and has a heavy-duty 2" magnet. They claim typical SWR is 1.25:1. The antenna comes with 15 feet of RG58 coax with a PL-259 connector. You get a free vinyl magnet pad to prevent scratching the vehicle. The antenna comes with pretuned whips for 146 MHz, 220 MHz and 440 MHz. The antenna is rated at 300 watts handling capacity.

I don't have radios on 220 or 440 so I only tested the antenna on 2 meters. I recently purchased a van and needed to put an antenna on it. I simply took the antenna out of the box, stuck in the 2 meter whip, routed the coax, hooked up the connector, and was on the air. I checked the SWR and it was 1.2:1 or better across the band.

This antenna is truly a bargain. It sells for $15.95 with all three whips. I have had both antennas operational for quite a while now and I am very happy with each. RF

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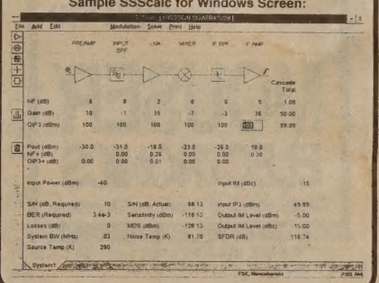

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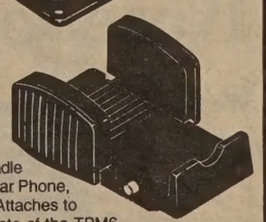

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S & S Engineering's PC1

by Mike Bryce WB8VGE

If there is one drawback to building your own rigs, it has to be VFO calibration. At least in the rigs that I've built in the past, I needed a GPS receiver to know where I was. The only thing I could say with any given truth would be that I'm on the 40 meter band. Well, come to think of it, some of the rigs I've built worked on more than one band at a time. But, that story is for another day.

The PC1

Knowing where you're at on the band will be a lot easier now that S & S Engineering has come out with the PC1. This hand-held programmable frequency counter will count up to 40 MHz. You can preset the counter to count up or count down. You just set the internal DIP switches and connect the PC1 to your transceiver. It will handle any IF offset and backward-tuning VFOs. The PC1 is offered in both kit form and assembled and tested. There's even a punched, silk-screened case to hold the PC1. My review of the PC1 is based on the complete kit, including the case. I did not use the AC adapter, but one is available.

Inside the PC1

The PC1 is built on one double-sided PC board. Whoa! Make that two PC boards. Well, sorta one and a half. Let me explain. The PC1 is on one PC board, but you cut the display section away from the main logic board. You must do this if you intend to use the case. If you just want the bare-bones kit, then everything mounts on one board. If you order the kit, complete with the case, S & S will cut the PC board for you. Otherwise, you'll receive the PC board as one piece. When the PC1 is assembled inside the case, the display board is connected to the main logic board via a ribbon cable. Don't worry, you won't have to assemble the ribbon cable, it's already done for you.

The display board holds the LED readouts as well as the two toggle switches controlling power and frequency selection. Two self-tapping screws hold the front panel in place while the main logic board is held by a slot in the sides of the case. Except for the ribbon cable, there are no loose wires running about inside the PC1. Connections to the real world are made with PC-mounted connectors.

Building the PC1

Except for the solder, everything you need to assemble the PC1 comes with the kit. As with all the S & S Engineering kits, all the parts are first rate.

As in most kits, you start by stuffing the board with the resistors. Instead of instructing you to install R1, R2, R3, and so on, you're told to install all the 10k resistors. A table then lists all the R numbers requiring a 10k resistor. This method is carried out with the capacitors as well. It's a bit different from what most of us have seen in the past, but the end result is the same. I did, however, find it took me a bit longer to assemble the kit because I spent more time finding the various parts on the circuit board. But, to speed things along, many of the parts are contained in their own package. So, when you're told to install the 1k resistors, all the 1k resistors are in one pack. There's no need to wade through the whole pile looking for that one value. Saves time.

There are plenty of ICs in the PC1. However, there are no IC sockets supplied with the kit. If you want, you can use sockets. Radio Shack carries a nice selection, or you can order the socket kit with the PC1 for a small charge. All the ICs come on a foam block covered with aluminum foil to protect the ICs from static electric discharges. When you're instructed to install IC1, it's the first chip on the block. Then IC2, IC3, and so on. It's the small things like this that make building the PC1 a real joy.

I did not use sockets on the PC1 I built, and soldered the chips on the PC board. Down the road, if you have a bad chip, there's nothing you can do about it except to remove it one pin at a time. Although, a good bean dip does help with some bad chips!

After the ICs have been installed, the rest of the PC board is stuffed. I found assembly to be simple and quick. A PC component layout helps in finding each part's location on the board. The PC board is also silk-screened with the component numbers. There is something else about the PC1 that I haven't seen in a long time: The PC board has a solder mask on it. This solder mask should really help keep those nasty solder bridges from forming. A solder mask is not an excuse for sloppy soldering, but I'm glad to see S & S Engineering add this feature to the PC1 kit.

Testing and Adjustment

Lucky for us, there's not much to do after you have the kit assembled. Double-checking your work is foremost. Then use a dash of denatured alcohol to clean the PC board of solder flux before you apply power.

Testing the PC1 is quite simple. Follow the directions in the manual to preset the dip switches. Apply power and observe the display.

As you change the settings of the dip switches, the display should return the correct reading. If not, you have a screw-up someplace on the board that needs your attention.

The PC1 fired up without a single puff of smoke. If you're not as lucky, there are some troubleshooting tips to steer you to the problem. Remember, this is a double-sided PC board with plated-through holes. Removing a misplaced part will usually mean its demise. So, watch what you're doing!

Assembly of the PC1 is the easy part; the rest of the project involves picking off the signal from the transceiver. There are several examples shown to give you some idea how this is done. It usually involves tapping some RF from the VFO. By setting the dip switches inside the PC1, you can make the read-out follow even the strangest VFO tuning scheme.

But, if you're really stumped, send a copy of the transceiver's schematic to S & S and they'll show you where to pick off the required signal. They already have in their files all the necessary information for their own Ark-series transceivers.

The PC1 does a great job at displaying the frequency you're operating on. The large red LEDs are pleasing to the eye. The PC1 is just what a home-brew transceiver needs. It's simple to operate and easy to use. In the case of some of my home-brew rigs, I can now see the direction of VFO drift. I once had a rig I tuned by adjusting the heat vent in the shack, but that's another story.

Why, with money you earn from selling your GPS system, you can know where you're at and where you're going and still have cash in your pocket. RF

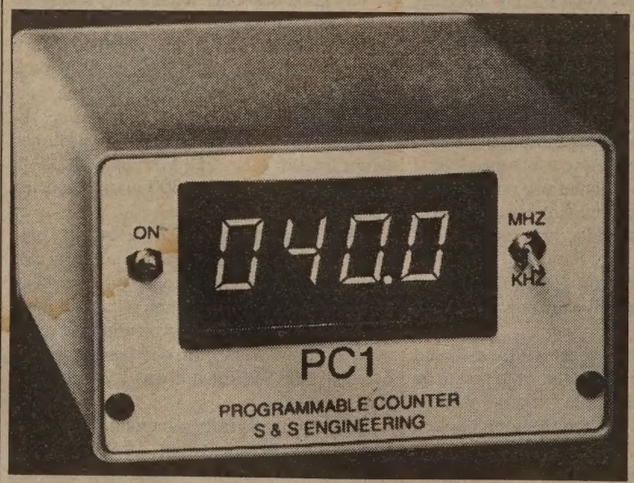

Photo A. S & S Engineering's PC1 counter.

Natural Power Charge Controller

by J. Frank Brumbaugh KB4ZGC

There are a number of complex and expensive circuits and commercial charge controllers on the market, designed to prevent a fully-charged storage battery bank from being overcharged when using solar panels, or a generator or alternator driven by wind or water. Many hams use these natural, renewable sources of power for their stations because they either live thousands of dollars away from the nearest power lines, they cruise the oceans on boats, or they enjoy operating on camping trips and on Field Day where normal AC power is not readily available. In every case, some means of preventing overcharging of their storage battery banks is required.

Why spend lots of money for a complex solution? The circuit described here costs no more than five dollars to construct, even with new (surplus) parts, yet it will provide the same protection for your expensive storage batteries as a commercial unit costing at least 10 times as much!

Theory of Operation

This simple circuit is illustrated in Figure 1. Refer to this illustration for the following discussion.

Positive voltage from the power source is applied to J1, and the negative side to common ground. The storage battery bank is connected as shown. As long as the battery bank is near full charge, or partially discharged, or under load sufficient to reduce battery terminal voltage below the full-charge level, the solar or other power source continues to supply charging current to the battery bank through normally closed contacts of relay K2.

When the charging source has brought the battery bank up to full charge, and continues to supply a charging voltage, this excess voltage is sensed by transistor Q1, which goes into conduction, energizing relay K1, which applies operating voltage to the coil of relay K2, which switches, disconnecting the charging source from the battery bank by opening the normally closed contacts. The controller will remain in this state as long as the battery remains fully charged and the power source continues to provide a too-high voltage. At night, with solar power, or with a cessation of wind or water flow, if this type of generator is used the controller reverts to its normal state as its operating voltage is reduced or eliminated. When the source again provides charging current and, depending upon the state of charge of the battery bank at that time, the controller will allow the source to charge the battery bank back to full charge and remove the source if necessary at that time, as described above.

Calibration

Depending upon the type of battery bank in use, and each type of storage battery has a specific voltage equivalent to full charge, apply this value of DC voltage across trimpot R1. Adjust R1 until both relays operate. This completes the calibration procedure.

Construction

This circuit can be constructed on a small piece of perf board or on a universal printed circuit board such as Radio Shack 276-150. Parts placement and wire lengths are unimportant. Only the leads between J1 and relay K2, and between relay K2 and the positive terminal of the storage battery bank must be of sufficient size to carry the maximum expected current with minimum voltage drop. Too, the contacts of relay K2 must be of sufficient capacity to carry this maximum current because all charging current must flow through the normally closed contacts.

Relay K1 is a special case, and while any 6-volt relay would probably function if you have one in your junk box, I recommend one costing just $1.00, available from All Electronics, P.O. Box 567, Van Nuys CA 91408; Catalog No. RSD-6V. Nominally a 6-V relay, it has a 220-ohm coil and is rated at 4.3 to 14 VDC. Where used in this circuit, the 4.3-volt specification is important to secure fast action, and its ability to accept a much higher voltage than 6V gives it a long life, even when faced with much higher voltages from the charging source, though the effective voltage across the coil is reduced by the voltage drop across zener diode D2.

CAUTION: This relay has a polarized coil. The positive voltage *must* be applied to pin 3!

The LED, D4, shown in Figure 1 is optional and need only be used if relay K2 is double-throw, and if you want to know at a glance whether your battery bank is fully charged. Capacitor C1 damps relay chatter which can occur right at full battery charge and borderline charging by the source.

Conclusion

Once this controller is constructed and calibrated, it need never be touched again. It will faithfully stand guard over your expensive storage battery bank. But don't forget to maintain the electrolyte levels if you use deep cycle lead-acid or lead-calcium storage batteries. Gel-cell and NiCd battery banks require no maintenance, nor do maintenance-free lead-acid storage batteries. Use only distilled water to top off battery cells. Never use tap water! RF

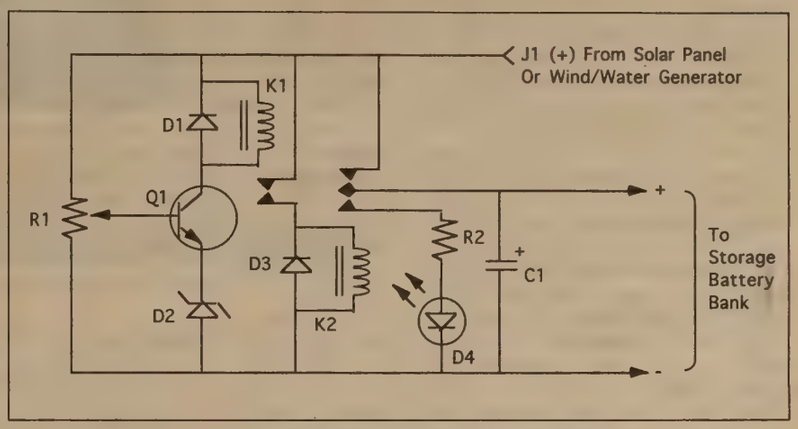

Figure 1. Natural power charge controller.

Parts List

C1	22 µF 25V electrolytic
D1,D3	1N914, 1N4148, etc.
D2	6.8- or 7.5-volt zener diode, 400 mW
D4	LED (optional)
J1	Builder's option
K1	6V SPST DC relay (see text)
K2	12V SPDT or DPDT DC relay (see text)
Q1	2N3904 or equivalent
R1	10k-ohm multiturn trimpot
R2	1000-ohm 1/4W 5% (optional)

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Dummy Antennas

by Robert C. Green W3RZD

Let's suppose it's one of those days when your favorite band is open and you want some of that DX that's rolling in. You call CQ, a station answers, and it's a country you've been trying to get for a long time. But then what happens? Right in the middle of the contact a strong signal comes on the same frequency and completely blocks out the station you're working, ruining all hopes of finishing the QSO. Of course there is no intelligent modulation except the word "Testing," which is repeated a zillion times. Then the voice that belongs to the offending station lets everyone know it is on the air by calling CQ for no less than five minutes, and does so in such a manner that lets everyone know they are assured of a place in heaven if they answer.

This type of character is not only obnoxious, he is also breaking the law. FCC regulations state that a transmitter can not be tested on the air except for a very short period of time. Just how long is a "short period of time"? That's hard to define, but it certainly does not mean long enough to cause prolonged interference to other stations. Perhaps a good answer might be "just long enough to check if the antenna is loading properly," and that shouldn't take more than 15 or 20 seconds. But if a transmitter can't be tested on the air, then how do you check it? Simple: You don't use an antenna that radiates, you use a substitute called a dummy antenna or dummy load.

Choosing a Resistor

Basically, a dummy antenna is a resistor capable of handling the output wattage of the transmitter, and has the same resistance as the output impedance of the transmitter. But this isn't as simple as it sounds because there is a definite "NO-NO" as to what type of resistor can be used. Any resistor used as a dummy load must be *non-inductive* at all operating frequencies of the transmitter.

There are several kinds of resistors used in radio; two types are composition and wirewound. A composition resistor is made of carbon and other ingredients, and is virtually non-reactive up to 100 MHz. However, these resistors have a drawback in that they are made in low wattage values. The normal composition resistor used in constructing circuits ranges from 1/8 watt to 2 watts, and will have values from a fraction of an ohm to many megohms. Special types of composition resistors are made that do have ratings up to 200 watts, but usually the resistance does not exceed 100 ohms. This type of resistor is expensive and hard to come by—the average radio parts store does not stock them.

A wire-wound resistor is made with a special type of wire, usually nichrome, which has a high resistance value per inch of length, and is wound on a vitreous (glass-like) form. A resistor of this type can be made in relatively high resistance and high wattage values. However, as the wire is wound around a cylindrical form it will behave as a coil and have inductance, which will react with other components to form a resonant circuit. This effect is even more noticeable as the frequency increases. For this reason a non-inductive resistor is necessary so the dummy antenna appears as a resistive, not reactive, load to the transmitter. Remember, an actual antenna is supposed to be purely resistive.

Preparing the Resistor

Non-inductive resistors used in dummy loads manufactured for amateur use normally have a power rating of 100 to 150 watts. However, if the resistor is immersed in a bath of the proper kind of oil it will have a dissipation of 1 kilowatt for about 10 minutes. The length of time depends on the type and quality of the oil. Normally transformer oil is used, which is the same type of oil the electric company uses in large power transformers to keep them cool.

Transformer oil contains a chemical known as polychlorinated biphenyl, or PCB. This type of oil has to be treated with respect; *be careful not to breathe any hot vapors that may escape, and make sure to wash off any oil that gets on your skin.*

> ***"Basically, a dummy antenna is a resistor capable of handling the output wattage of the transmitter, and has the same resistance as the output impedance of the transmitter."***

The resistor is mounted in a leak-proof metal container that is grounded to the transmitter to prevent radiation. The container also has an escape valve to vent built-up pressure that may result from over-heated oil.

Mineral oil can be used instead of PCB, but with a lower power rating. When using mineral oil at one kilowatt of power, the time limit for which the resistor can be operated at a safe level is reduced by 90%. However, when a transmitter is operated at 200 watts or less, the dummy antenna can be used for several hours without damage. None of the precautions that apply to PCB have to be watched for with mineral oil.

Never use automobile motor oil in place of PCB or mineral oil; there have been some very disastrous results from doing so. Whenever PCB has to be discarded, for any reason, contact the power company for proper instructions.

Since the early days of radio some form of a resistor has been used as a dummy antenna, although it didn't always look like a resistor. Two forms of load "resistors" used were a tank of water and ordinary 115-volt lamp bulbs.

Because of their output power most broadcast stations relied on a tank of water for a dummy load. Normally this was an oblong-shaped wooden tank that sat behind the transmitter. The tank was usually placed in a shallow metal or concrete "swimming pool" that was equipped with a drain, in case there were any leaks. The general rule of thumb called for five gallons of water per kilowatt of power, which worked out pretty well.

In those days antennas were usually fed with a two-wire open transmission line, so a similar but shorter transmission line was used to connect the transmitter to the dummy load. At the tank each wire of the transmission line was connected to a metal plate about five inches long and one or two inches wide. One plate was immersed in the water at each long end of the tank. The resistance of the dummy antenna depended primarily on the size of the tank, and by changing the depth and spacing of the plates the resistance could be varied from about 90 ohms to 600 ohms.

Many an amateur took a different and cheaper approach by using lamp bulbs. For low power one bulb was used, one that was rated at or above the power output of the transmitter. However, for a high power transmitter one high wattage bulb could not be used, as the dielectric material in the base of the bulb broke down from the RF voltage. As the transmitter frequency was increased, the breakdown was even more pronounced, so several lower wattage bulbs were wired in a series-parallel combination.

Using lamp bulbs as a dummy antenna is not the best practice as the resistance of the filament changes with voltage and frequency. The only good thing that can be said for them is that they will absorb power, but what the RF resistance will be is unknown. However, for low power QRP rigs many amateurs use a #47 pilot lamp mounted in the end of a PL-259 plug. A #47 lamp is known to be approximately 50 ohms at 28 MHz, but a 50 ohm 2 watt composition resistor is definitely better. A dummy antenna doesn't have to be exactly 50 or 75 ohms, but the closer the better.

Figure 1 shows an easy-to-construct 40 to 50 watt dummy load made with 20 watt 8 ohm non-inductive ceramic-encased resistors, available from Radio Shack (part number 271-120). Six resistors are connected in series to give 48 ohms, which is close enough for a 50 ohm load, and if a 72 ohm load is needed, nine resistors are wired in series.

The resistors are sandwiched between heat sinks made of 1/8"- or 1/4"-thick aluminum sheets, which just about doubles their normal wattage rating. An SO-239, or BNC, chassis-mount coax jack is mounted on one of the pieces of aluminum, and one end of the string of resistors is soldered to the center conductor of the jack. The other end of the series is connected to a soldering lug secured under a lock washer and nut on one of the clamping bolts. Before drilling the hole for the coax jack make sure that the resistor lead will reach the bottom of the jack.

I recommend using silver solder instead of regular solder because of its higher melting point, and there will be less chance of a connection opening up due to heat. If you use silver solder, a high wattage soldering iron or a small blowtorch will be required. After soldering a connection let it cool, then check the resistors on each side of the joint for any change in resistance that might have occurred due to the soldering. Silver solder can be purchased at Radio Shack.

The resistors have three smooth sides and one rough side, so when mounting the resistors place them so that a smooth side is next to each sheet of aluminum. Before tightening the clamping bolts, spread transistor heat-sink compound on the sides of the resistors that touch the aluminum. Don't try to use vinyl tape or heat-shrink tubing on the connections between the resistors, as it will melt. Just make sure that none of the connections between the resistors are touching either aluminum plate. Also, don't attempt to immerse the dummy antenna in any liquid to get a higher power rating—the liquid can short out the resistors.

A dummy antenna is an essential part of any radio installation, and if you don't have one, get one. Also, it is a good practice to use an ohmmeter to check the resistance of a dummy load before connecting it to a transmitter. Ordinarily a resistor is rugged and will take a lot of punishment. But don't mistreat a dummy load as any damage that occurs can result in a ruined output stage in the transmitter, and that can cost money. RF

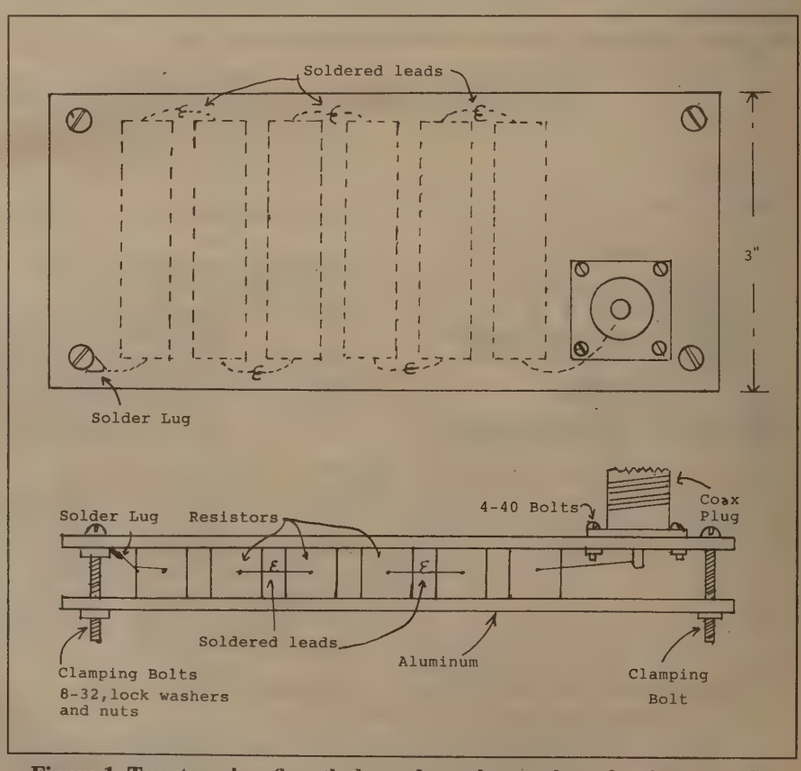

Figure 1. Top: top view (length depends on the number of resistors used); bottom: side view.

RF vintage review

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Yaesu FT-680R Transceiver

by Paul Grupp KA1LR/4

The Yaesu FT-680R is a compact, 6 meter, multimode transceiver designed for both mobile and fixed station use. It is part of a rather complete line of nearly identical VHF/UHF transceivers which includes the FT-480R 2 meter and the FT-780R 430 MHz multimode rigs.

The FT-680R is fully synthesized, with a four-bit NMOS microprocessor-controlled operating frequency, scanning, priority channel selection, and the various memory functions. Frequency coverage is from 50 to 53.99999 MHz, in steps of 10 Hz, 100 Hz, and 1 kHz in SSB (CW and AM modes) and 1-kHz, 20-kHz, and 100-kHz steps in the FM mode. These steps correspond to one click on the main tuning knob, or one press of the up or down buttons on the microphone.

Of the 16 controls on the front panel, 11 are associated with frequency selection. The other five are volume and squelch controls high/low power switch, and a noise-blanker on/off switch. The microphone jack is an eight-pin affair identical to that found on many Icom rigs and provides for microphone-mounted up/down scanning switches, a "Call" button for tone-burst operation, and a microphone lock switch, in addition to the obligatory PTT, signal, and ground lines.

Underneath the front panel on the right-hand side are three switches: SAT, which allows the operating frequency to be changed while transmitting; a repeater offset selector; and a busy/clear scanning selector. A miniature connector is located near the back of the bottom panel, allowing tone burst on 6 meters. The unit's speaker is also on the bottom panel.

The rear panel is mostly heat sink, but squeezed into the corners are jacks for antenna, power, and CW key. The entire unit measures approximately 2-1/2" high, 7-1/4" wide, and 9-1/2" deep. A hefty mobile bracket is included, as is a wire bail for home use. The bail is necessary because the speaker housing prohibits the rig from sitting flat on a table without it.

Other Features

Upon first unpacking the FT-680R, I decided that the front panel was the most confusing I had ever encountered. This is no small distinction, considering the needlessly complex panels on some of the competition! However, my opinion was modified considerably after reading the instruction manual. In retrospect, the 680 offers a thoughtful layout. What need work are some of the labels over the switches. For example, use of the switch marked DIL is not exactly obvious. A glance at the manual explains everything. The switch "... transfers frequency control from the memory channels to the main tuning knob." That makes perfect sense, but please don't ask me what it has to do with DIL! Once you understand some of the confusing labels, the front panel is a lot friendlier.

There are four memories available, as well as a priority channel. These function in the generally accepted manner. An interesting and extremely useful twist is the clever programming of the up/down switches on the microphone. At first, they appear to operate just like the mike switches on countless other rigs, but if you hold down one of the switches for more than half a second, the automatic scanner is activated. Even if you release the switch, the unit will continue to scan up or down the band. To stop, simply press either the up or down buttons or the PTT switch. Surprisingly, pushing the PTT switch during scanning will not result in a transmission. The next time you press it through, it will behave normally and you'll be on the air. Nice touch!

The controls on the underside of the transceiver are inconvenient and their labels impossible to read without turning the rig over. Yaesu's engineers correctly assumed that most users would rarely need access to these controls, but they failed to consider how easy it is for an operator to unknowingly change the position of the switches while moving the rig.

Particularly useful to the 6 meter DXer is the inclusion of semi-break-in operation on the CW mode. Also included is an 800-Hz sidetone. Missing is an amplifier-keying jack. With 4CX250 amplifiers so easy to home-brew for this band, such a jack is sorely missed. Fortunately, adding one should prove to be easy for anyone on familiar terms with a soldering iron.

On the Air

The FT-680R spent several weeks accumulating dust on the shelf after its arrival because I couldn't find the time to install a proper 6 meter yagi. One Friday evening as my wife and I settled in to view our favorite TV program, we found it had been pre-empted. The Boston station we had planned to watch faded in and out of the hash, and then for a few minutes a Florida news broadcast captured the set completely! Without so much as a word, my wife went to the ham shack, got the FT-680R, and dropped it at my feet. We found a spare 12-volt supply and then hooked up the rig to a Radio Shack TV antenna on the roof. The SWR was about 3:1, but the rig put out almost full power and didn't make any funny noises, so I started tuning up the band. Among other things, we heard a Georgia station calling CQ, and I gave him a quick call. Wonder of wonders, he came back with a 59 report! Over the weekend, I worked 21 states in the South and Midwest, using 10 watts PEP and a TV antenna fed with 75-ohm coax. Bob Cooper in the Turks and Caicos came in 59 + 20 Saturday morning, but I apparently couldn't be heard over the pileup of kilowatts and stacked arrays. I did manage to make several contacts elsewhere using the low-power position (1 watt PEP), but signal strength reports at this power level were not uplifting.

The Yaesu FT-680R six-meter transceiver. (Photo by KA1LR)

When the band finally went dead and I reconnected the TV, it occurred to me that I had forgotten about the lossy 300-ohm to 75-ohm transformer installed at the antenna. Close examination revealed it to be undamaged, but I've always wondered how much power I lost in the darn thing!

All things considered, the 680's performance is outstanding. Receiver sensitivity is more than adequate for all but the most demanding weak-signal work. After a couple of hours with most multimode rigs, one usually begins thumbing the catalogs in search of a suitable preamp, but no one who used the 680 ever felt the urge. Receiver audio quality was very good—better than that found on other Yaesu transceivers. Transmit audio reports were excellent, and I'm just as glad the 680 doesn't include a speech processor! The Monadnock region of New Hampshire is not exactly bursting with FM 6 meter activity, so about all I can say about the FM section is that it works.

The instruction manual is very complete. Several other well-known manufacturers would do well to offer the sincerest form of flattery—imitation. As well as the usual specifications and operating instructions, the FT-680R owner is furnished with alignment and service instructions, a parts list, a theory of operation section, and three poster-sized schematics. An amateur radio operator deserves nothing less.

A rather complete line of optional accessories is offered for the 680. For those of us too lazy to build our own, there is the FP-80 DC power supply. The AD-1 antenna coupler permits a single mobile antenna (the RSL-50) to be used with both 6 and 2 meter rigs at the same time. One less hole in the old crate. Home-station operators will appreciate the choice of stand microphones, including one with scanning push-buttons in the base. Finally, for owners of the 680 and one of its twins, there is the SC-1 station console which makes the rigs into a single compact package and includes a power supply, digital clock, 16-button DTMF pad, and some convenient switching.

Conclusion

Six meters remains one of our interesting amateur bands. Propagation is often unpredictable and wild, rewarding the alert operator with dizzying tours of the country. On occasion it is rather tame, behaving like a mischievous 10 meters, offering long, solid rag-chews before sweeping your friend off the S-meter. As solar activity provides fewer opportunities to sample the thrills of 6 meter DX, the FM position on the mode switch will offer a bastion of tranquility and camaraderie, free from the crowding and circus-like atmosphere that prevails on other, more populous FM bands. Six meters offers some of the very best of the HF and VHF worlds, and the FT-680R provides an excellent means to sample the action. In features, price, and performance, it stands with the best. Yaesu has a winner! RF

Reprinted from the March 1982 issue of 73 Magazine.

RF review

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The ASA DI-2B HF Half-Wave Dipole

by Arnie Johnson N1BAC

How many times have you wished that you had a small rotatable dipole? I have heard many local DXers talk about it, but they don't seem to have done anything about it. Also, how about hams who have a special band they like to work, such as 17 meters, and would like to work it mobile, base, and while camping? For all that fit the previous descriptions, I think I found just the right antenna for you, the ASA DI-2B HF half-wave dipole.

The review antenna was shipped in an approximately 5-foot-long tube, containing two monoband "fiberwhips" and a double-U-bolt L bracket. It was very easy to see that the L-shaped bracket was made to screw in the two fiberwhips, sticking out in opposite directions. One of the attachments had an SO-239 connector on it for attaching your favorite piece of coax.

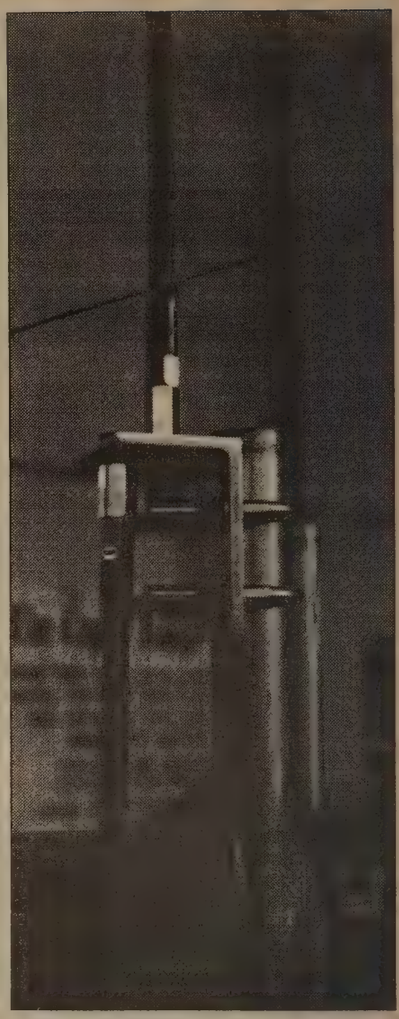
The two fiberwhips were the ASA standard mobile whips, capable of 250 watts PEP. The ones supplied were the HFA17 for 17 meters. Each whip pack consisted of the lower section of the whip (loading coil), the stainless steel whip section, an Allen wrench, and a small piece of paper with directions for putting them together. Heavy-gauge copper wire is wound on a 3/8" Fiberglas staff covered with industrial-grade black heat shrink with a 2-1/2" bottom ferrule, for heavy wind load, utilizing a standard 3/8" x 24 thread. The load and whip unassembled are approximately 4' long; 8' assembled.

Assembly

The directions for assembly are easy. Just insert the whip into the lower section ferrule about 4" and tighten the set screws with the Allen wrench. Install a VSWR meter at the transceiver and apply 10 to 25 watts of power. Adjust the VSWR meter and output frequency for the lowest VSWR reading, indicating resonance. If the resonant frequency is higher than desired, loosen the set screws and extend the top whip until the desired resonance frequency is reached, or just the opposite if the frequency is lower than you wish. Adjustments should be made in small increments. The VSWR should be 1.5:1 or less when properly matched. After tuning is completed, tighten the set screws securely. Is that easy or what?

Performance

Well, how did it work for me? After assembly I mounted it on a 10' section of TV mast I had handy which was mounted on a TV rotator. I then noticed that the U-bolts would only fit the L-bracket to make the antenna vertical, so I tried that. The VSWR was 3:1 across the 17 meter bandwidth with no indication of dip, so I adjusted the whips



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1" with no change in VSWR. I then wondered if one antenna (the lower one) being within 2" of the TV mast might not allow the antenna to tune properly. I then jury-rigged the L-bracket to mount the antenna horizontally. The VSWR then showed an indication that I needed to shorten the antenna whips for resonance. I finally received resonance in the center of the band at 6" into the lower portion. The VSWR was within 1.3:1 across the 17 meter band (18.068-18.168 MHz). The supplied paperwork describes typical bandwidths for 2:1 as: 160m—10-15 kHz; 75m—50-60 kHz; 40m—75-85 kHz; 20m—100-120 kHz; 15m—150-200 kHz; and 10m—400-500 kHz.

Signal indications on receive showed a 2-3 S-unit change when rotating the antenna. I was able to work several Italian stations and several stateside ones during the time I had the review antenna. Signal strengths varied with the conditions, but all said that the antenna was doing just fine and could see about the same difference in the signal when I rotated it, but with no real dip. I don't happen to have a beam on 17 meters so I couldn't make a side-by-side comparison.

The ASA DI-2B is a well-built antenna system, designed for special situations, such as limited space in apartments, attics, boats, RVs, campsites, and restricted areas. One antenna can be used on a car, truck, or bus, then mounted on the L-bracket for dipole operation when stopped. Don't expect it to operate as well as a full half-wavelength dipole or beam.

The only negative I could find was the inability to mount the bracket/antenna horizontally without jury-rigging the bracket. ASA might consider drilling the U-bolt holes in the bracket to allow either vertical or horizontal mounting.

The antennas are made for the following bands: 6, 10, 12, 15, 17, 20, 30, 40, and 80 meters. Just order HFA-xx where the xx is the band. The price is $45 plus $6 shipping (SC residents add 5% sales tax). Prices are for inside the continental US only. RF

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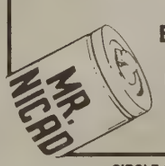

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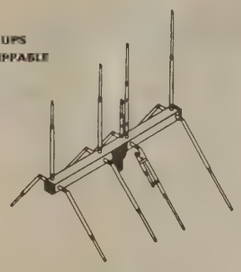

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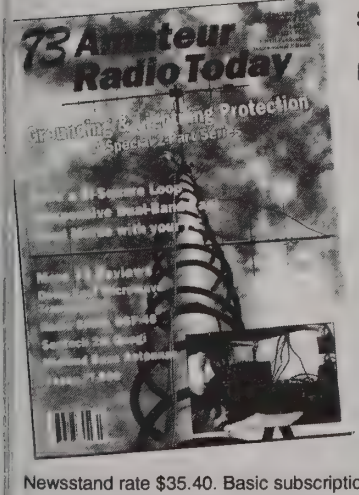

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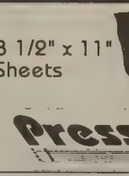

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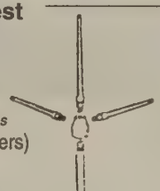

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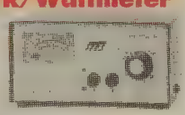

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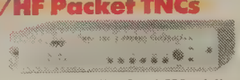

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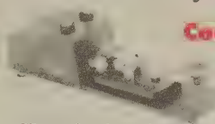

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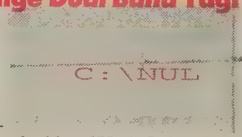

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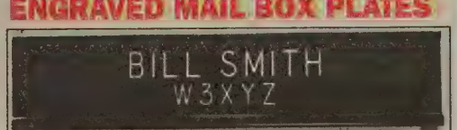

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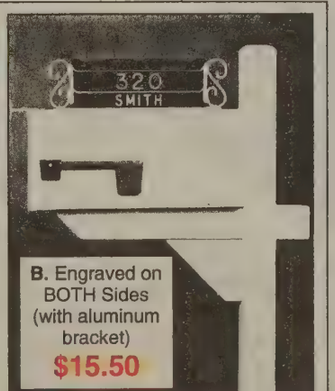

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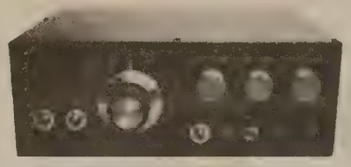

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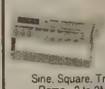

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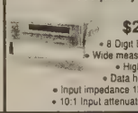

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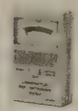

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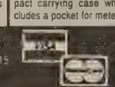

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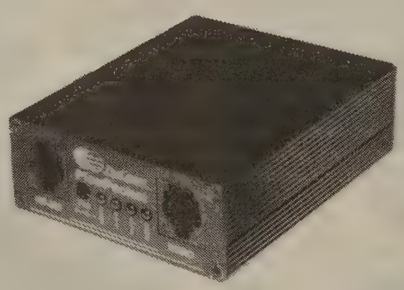

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Cutting Antennas to Resonance

Steve Katz WB2WIK/6

The problem: You've installed a dipole, inverted vee or whatever "by the book," and did everything "right," but when you go to check it out with an SWR bridge, you find the SWR is high on your frequency of interest. Oh no! What can you do *now?*

The solution, like the problem, is amazingly simple. In fact, I'd call this a "stupid question," except that there *are* no stupid questions, for only the stupid *don't* ask questions.

What You Did, and Didn't, Do

Assuming we're speaking about HF ("low-band") antennas, you may have assembled your own from wire and some insulators, or you may have opted for a store-bought variety. It makes no difference, all HF antennas need to be "field-tuned." The reason is that the formula for a half-wave dipole, 468 divided by the frequency in MHz, only works for uninsulated wire installed in free space, and few installations are this ideal. A half-wave in free space would actually measure 492 divided by the frequency in MHz (to yield the dimension in feet), but the 468/f formula takes into account that conductors all have a *velocity of propagation factor* (V.F.) of less than one when used in real-life conditions. The textbooks discussing antennas assume the V.F. of uninsulated wire in typical real-world applications is about 0.95, or 95%. This means a radio wave travelling in the conductor travels about 95% as fast as it would in a vacuum, and the assumption is reasonably valid.

However, the velocity of propagation factor varies, depending on the construction of the wire used. Insulated wire will have a V.F. lower than 0.95, depending on the insulating material used and its thickness. The higher the *dielectric constant* of the insulator, and the thicker it is, the *slower* (lower) the V.F. will be. A wire covered with a thin coating of ordinary polyethylene might have a VF of 0.90 instead of 0.95; a wire covered with a thick coating of Teflon might have a V.F. even lower than this. These factors alter the real-world length of a half-wave dipole.

In addition, antenna height above ground and proximity to other conductors will alter the resonant frequency of an antenna. You won't see much difference in the resonance of an antenna tuned to 440 MHz whether it's installed three feet or three hundred feet above ground, because even three feet is 1.35 wavelengths! But at 3.7 MHz (80 meters), to achieve a height of even one-half wavelength above ground is impossible for most amateurs. This would require an installation where the antenna is 133 feet above the ground! Yet, the "468/MHz" formula is intended for such installations, impossible as they might seem.

Even if your antenna is a half-wavelength above ground (achievable for many on 40 meters and higher frequencies), it will be influenced by trees, houses, utility poles and wiring, interior or exterior plumbing and conduit, and other objects located nearby, especially objects located near the antenna ends. A dipole of any length has its voltage "maxima" (highest voltage points) at its "tips," and antennas are easily detuned by conductive objects located near those tips. This is why inverted-vee dipoles whose wire ends are brought down close to earth often resonate well below the formula frequency: The earth ground near the tips adds considerable loading capacitance, and substantially lowers resonance. Old-timers all know this, but many newer hams do not.

Baluns

All the factors described above occur whether or not you use a "balun" at your antenna feed point. There are many balun designs. Some are effective, some are not. A half-wave dipole in free space, installed so its feedline is at a right-angle to its radiating elements, requires no balun. In such installations, a balun is superfluous. But many installations are not in free space, and many do not have enough height to run the feedline at a right angle to the radiating elements for a sufficient distance. In these situations, the radiation pattern from the dipole may be "skewed" by field addition and cancellation from the feedline. And under some conditions, especially when the antenna is operated off-resonance (at a frequency other than the one to which the antenna is perfectly tuned), the feedline can radiate and become part of the antenna. This is because the reflected wave (the signal reflected back from the antenna feed point to the transmitter) is conducted along the *outer* surface of the coaxial cable's shield. (When the feedline is perfectly matched [SWR = 1.0], all the RF current is conducted by the *inner* surface of the cable's outer conductor, or shield, and the balance of the shield prevents the feedline from radiating.)

I'm neither for nor against baluns. Sometimes they help, sometimes they don't. But they rarely *hurt,* especially if the balun is of good design and can handle the power applied to it. A good rule of thumb is to use a balun capable of handling much more power than you're actually running, to assure the balun doesn't "saturate." A 5-kW-rated balun would not be overkill for a Novice (150-watt) installation.

Antenna Tuners

Antenna tuning units, transmatches and so forth are wonderful accessories. However, you will have absolutely no need for them if you use a properly installed and tuned dipole antenna fed with coaxial cable, except possibly on 80 and 160 meters, where the amateur bands are too "wide" for single-frequency resonant antennas. A simple dipole will normally have 2% to 2.5% bandwidth for a reasonable match. This means a 40 meter dipole will match quite well over a range of about 175 kHz; so, if you tune your 40 meter dipole for the center of the Novice subband (7.125 MHz), it should provide an acceptable match from 7.037 to 7.213 MHz, well overlapping the entire Novice subband. The antenna will be usable beyond this range, but its SWR might rise above 2:1. A 15 meter dipole tuned to 21.150 MHz (the center of the Novice subband) should match well across the entire 15 meter band. Likewise, a 10 meter dipole tuned to 28.40 MHz (the center of the Novice subband) will match well from 28.045 to 28.755 MHz, and cover essentially the entire CW and SSB portions of that band.

Eighty meters is another story. A dipole tuned to 3.70 MHz (the center of the Novice subband) will likely provide a reasonable match only from 3.65 to 3.75 MHz. This covers the entire Novice band just fine, but the dipole's SWR might rise above 2:1 above and below these points. It is on this band that a transmatch could help. If your rig contains an automatic antenna tuning unit (ATU), by all means feel free to use it per the instructions. But I would not run out and spend a lot of money on a manual "outboard" tuner as a station accessory for a coax-fed dipole—it simply isn't necessary. It is cheaper and easier to install a broadly-tuned antenna for a band like 80 meters, and you'll have fewer knobs to adjust when changing frequency. One antenna design offering about 20% wider bandwidth than a plain wire dipole is the "double bazooka" coaxial dipole, described in the *ARRL Antenna Book* and elsewhere. Another idea is to use a parallel element dipole, where instead of using a single pair of wires for the dipole elements, multiple sets of wires, tuned to various frequencies in your band of interest, are connected in parallel at the feed point and create a wide-band dipole antenna. Consult the *ARRL Handbook,* the *ARRL Antenna Book,* and other references for more information on this subject.

Then What?

OK. You've installed your 40 meter dipole, which, per the formula, should be 65 feet long overall (32'6" per leg) to resonate at 7.2 MHz. You get it as high as you can and use good quality 50-ohm coax to feed it. You measure the SWR and find it to be 2.7:1 at 7.2 MHz. Hmmm. The next step should be to transmit again using the lowest power possible (the lowest power that will still allow you to read SWR on your meter—preferably less than 1 watt), and go up and down the band to find a frequency on which the SWR "dips" to its lowest point. You might find that even at 7.01 MHz (assuming you're licensed to transmit there—this would require an Extra Class license!) the SWR is still 2:1. Better than it was at 7.2 MHz, but still not great. Fine. This indicates a *trend.* Your measurements indicate that the antenna is resonant *below* the 40 meter band. This is not unusual at all, and is probably the norm for most installations. What do you do now?

You *cut* some length off the antenna, that's what! At 40 meters, an antenna will change in resonant frequency by about 100 kHz for every 11" change in dipole length. This 11" is in *overall* dipole length, which corresponds to 5-1/2" per "leg" of the dipole. Since your 40 meter dipole appeared to resonate *below* the band, try cutting 6" off each end, then re-installing it and making the measurement again.

Aha! Now the SWR dips within the band! But its dip point (frequency of lowest SWR) is now 7.08 MHz, and you wanted it to tune up at 7.15 MHz. Do you have to keep snipping off a few inches at a time until you stumble on the correct dimension?

Of course not. Since we know a half-wave dipole will change in resonance by 100 kHz for every 11" in length, we can make a simple calculation to determine exactly how much to cut this time: We want to change resonance from 7.08 to 7.15 MHz. This is 70 kHz, or 70% of 100 kHz, and 70% of 11 inches is 7-11/16". This means we'd want to cut our dipole one-half that length off each leg, or 3-27/32". Trim 3-27/32" off each end of that dipole and it should dip right at 7.15 MHz.

On 80 meters, the average change in dipole length for a 100 kHz change in resonance is 3'4-1/2" (overall), or 1'8-1/4" per leg. On 160 meters, the average change in dipole length for a 100 kHz change in resonance is 13 feet (overall), or 6'6" per leg. On 30 meters, you can change resonance by 50 kHz (which is the width of the entire amateur band!) by changing dipole length just 2-1/2" (overall), or 1-1/4" per leg.

Once your antenna is resonant *somewhere* in the band, you can calculate how much to trim or lengthen it to resonate it exactly where you want it to be. Sometimes, antennas are so greatly influenced by wire insulation, height above ground, proximity of other conductors, and so forth that they will resonate far outside the amateur band intended. Since you can't legally transmit outside the band (don't even *think* about it!), you have two possible routes for determining which way to adjust your antenna length:

1. Stay inside the band limits you're licensed for, and transmit with low power at a few points to determine a *trend* (if the antenna is too long [tunes up too low in the band] or too short [tunes up too high in the band]), and begin making adjustments based on this information. Or, a better way is:

2. Don't transmit at all, but use either a "noise bridge" (a device which indicates resonance and impedance by using your receiver, not your transmitter) or an "antenna analyzer" (which generates a miniscule signal to indicate antenna match—but the generated signal is too weak to interfere with anyone) to find out where your antenna resonates. I've used both with great success. Noise bridges are commercially available for as little as $70 or so brand-new, or can be home-brewed for less than that, following published circuits in the *ARRL Handbook* and elsewhere. Antenna analyzers are available for as little as $100 or so and are invaluable tools for antenna work. I'd rather use my antenna analyzer than a transmitter and SWR meter any day of the week, since the analyzer tunes continuously through the entire HF spectrum, including well outside the amateur band limits, and does so legally. Plus, the battery-operated antenna analyzers can be used in the field, without complicated equipment or AC power, so they can often be tried right at the antenna feed point, which is the most accurate place to measure SWR, anyway.

Table 1 shows a "tuning chart" which indicates the average change in half-wave antenna length versus change in frequency. You might find the information listed very helpful in future antenna work. Remember, when adjusting antenna length, make an equal adjustment to both sides of the antenna (dipole, inverted vee, or other "doublet" type)—don't just adjust one end. If you follow this chart and make all corrections necessary and *still* can't get your antenna to dip in SWR to anything reasonable (Note 1), your installation might just be an impossible case, where your antenna is so detuned by surrounding objects that it will never resonate where you want it. These situations happen, and when they do, you have no choice but to live with it or move your antenna to another location.

Note 1: A "reasonable" SWR might be 3:1 in some cases. This isn't that bad a match. If your SWR dips at your favored frequen-

Continued on page 21

RF user report

Uniden Corp. of America
4700 Amon Carter Blvd.
Ft. Worth TX 76155
Note: Uniden no longer manufactures this transceiver, but units are available from ham radio dealers and at flea markets.

The Uniden HR2600 Transceiver

by Harry M. Johnson NV7K

My two favorite modes of operation on the HF bands are 10 meter SSB with lower than usual power and 15 meter CW with true QRP power. During the peak of the past sunspot cycle I found I could work all of the DX and other stations that I had time for just by using these two modes.

For 10 meters I used a converted E.F. Johnson CB transceiver that puts out about 12 watts PEP on SSB. For 15 CW, I always use my trusty Heath HW-8 and about 3.5 watts. The Johnson Viking CB rig has a great receiver and is a very reliable radio that was pretty easy to convert to 10 meter operation. The problem, of course, is that the output of the PLL frequency synthesizer is channelized into the 40 CB channels. A VFO can be built and installed, but I never did get around to doing it.

While scanning through the newly arrived Amateur Electronics Supply catalog about a year ago, I noticed the Uniden President HR2600 all-mode 10 meter transceiver on sale for $190. I had heard that it was a nice rig and the price was right, so I bought one.

The package arrived and inside was the 7.32" (W) x 10.35" (D) x 2.44" (H) HR2600 transceiver. Included were: a mobile mounting bracket with screws, a hand mike with up and down frequency control, a rear panel "accessory" connector, a DC power cord, and a manual. The mounting bracket is the usual sturdy over-the-top type with two thumbscrews on each side, providing easy and solid mounting. The 500 ohm dynamic mike has the frequency change buttons on the top and the PTT switch on the side, and has a coiled cord with a 5-pin connector to mate up with the one on the front of the radio. The "accessory" connector is a molex-type nine-conductor with seven pigtail leads hanging out of it and is to be used, according to the manual, for connecting an external speaker or CW keying device. There is also an identical connector with a jumper included which must be in place to use the internal speaker. The power cord is 18 ga. wire, fused in the positive side and terminated with a polarized connector.

Physical Layout

The front panel layout is very usable and convenient. Across the top row, from left to right, are four rotary controls. At the left side are Mode (CW, LSB, USB, AM, FM) and SWR/CAL control for that function of the readout. The orange-lit LCD panel is in the center and to the right are Receiver Incremental Tuning (RIT) and RF gain pots. Across the middle tier on the left are Mike Gain (toggles an attenuator on and off "for use in noisy environments"); Tx, which puts the radio in key-down mode for tuning (hopefully into a dummy load); and Meter, which toggles through the four meter functions: S/RF for receiving and transmitting, respectively; Modulation, SWR Calibrate, and SWR. At the right middle are two push-button switches for RIT on and off and NB (noise blanker) on and off, respectively.

At the lower left corner is the mike connector. To the right is a horizontal bank of six more push-button switches. Across the top, left to right are: Dim, for the LCD panel; Scan, which will initiate or stop scanning of one predetermined segment of the 10 meter band, locking up on a signal strong enough to break the squelch; and Span, which toggles the VFO tuning increments among 100 Hz, 1 kHz and 10 kHz steps. Across the bottom are: RPT, which activates the 100 kHz frequency split for 10 meter FM repeater operation; Band selects one of four band segments to be used (28.000-28.499, 28.500-28.999, 29.000-29.499, and 29.500-29.699) and F.Lock, which locks the VFO at the indicated frequency.

In the center of the bottom tier are the two up and down frequency-changing buttons identical to the ones on the microphone, to be used for surfing and scanning, and a rotary, detented frequency changing knob. The operating frequency may be changed by either of these three input controls and by the increment selected by the Span switch.

At the bottom right are two rotary controls. Auto Squelch works in the conventional way, with one difference: If it is rotated all the way counterclockwise a click is felt and a switch activates an automatic squelch function. On-Off Volume works in the expected manner.

All controls are large enough and well-enough spaced to be operated easily, at least by my average-sized hands.

On the rear panel of the transceiver the large heat sink for the power amplifier transistors takes up about two-thirds of the space. At the right are the SO239 antenna connector, the polarized 13.8 VDC jack and the accessory connector.

The LCD display is 9/16" high and 2-3/4" wide and is adequately lit for in-the-shack operation. I most often use it in the dim mode. The meter display is at the left with S-meter numbers at the top and SWR values across the bottom. The transmit power function lights segments between the two. At the upper left corner is an indication of what mode the meter is in. To the right and about in the center of the readout is the "band" indicator which lights a, b, c or d, depending upon which band segment is selected as per the above explanation. If the repeater split for FM use is enabled, a "P" is visible at the top center of the display. The operating frequency occupies the right-hand half of the display. An underline bar moves between the last three digits of the display as the Span switch is toggled through its three positions.

Power and Accessory Connections

The power connector is the one-circular, one-half-elliptical type which I refer to as "modified Molex." Since my power systems are totally based on two conductor Molex fittings I simply made an adapter to plug into the back of the rig with a proper Molex connector on the other end.

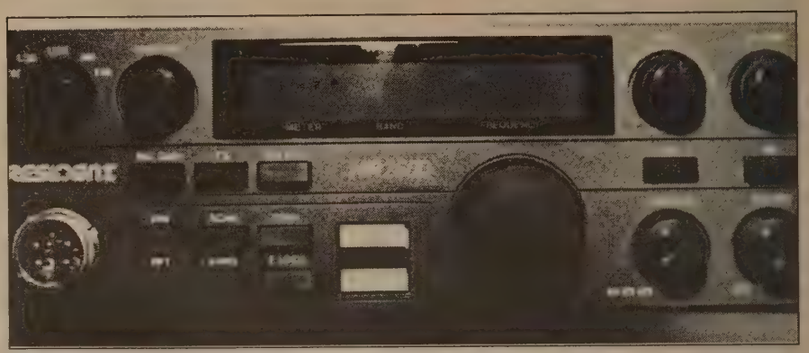

Photo A. Front panel of the Uniden HR2600 10 meter all-mode transceiver.

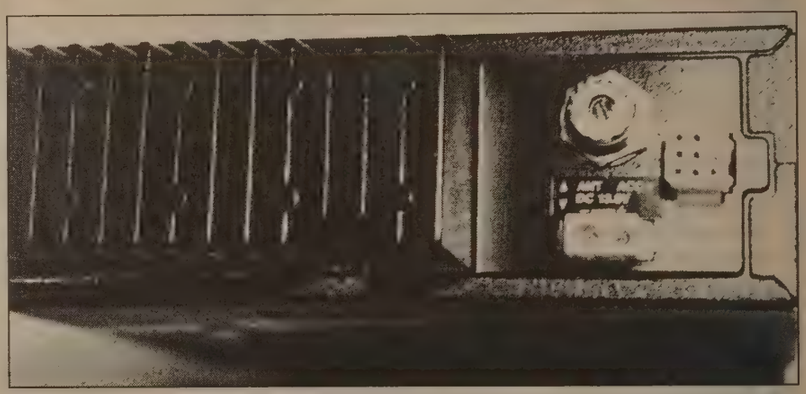

Photo B. Rear panel of the HR2600, showing the large heat sink and antenna, power and accessory connectors.

The accessory connector on the rear panel is, I must say, a bit unusual. A mating connector with seven attached pigtails comes in the packaging along with the one with two pins jumpered. If you want to use the internal speaker which is directed out of the bottom of the case you use the plug with the jumper. If you want to branch out a bit you must get to work and use some of the pigtail leads on the other connector. Pins 1 and 2 are used to attach an external speaker or headphones. Pins 8 and 9 are used to connect a key, with 9 being the hot or positive side. Pins 7, 3 and 6, and 4 and 5, are left "not connected." I soldered suitable jacks in place for the external speaker/headphone connections (I am a headphone nut) and did the same for the manual key connections. The internal speaker is a good one; I just prefer 'phones.

CTCSS Operation

For use with FM repeaters the HR2600 has built in CTCSS tone encode capability. To set the subaudible tone frequency the bottom cover of the radio must be removed (four Phillips screws). This allows access to a six-contact dipswitch. By setting the various individual switches as indicated in the chart in the manual, all of the standard tones from 67.0 Hz to 250.3 Hz can be selected. If the switches are set to all "on" or all "off" no tone is transmitted. If you are traveling and plan to use "toned" 10 meter repeaters, bring your manual and a small Phillips screwdriver along!

Operation

Operation of this little rig is very straightforward with a few exceptions. Having the amateur 10 meter band further broken down into four "bands" is a bit unusual, but not at all hard to work with. Along with that, when using the up-down buttons on either the front panel or the mike, when you get to the upper or lower limit of that particular "band" it returns to the opposite limit and begins to scan again. By using the manual VFO knob, you can begin at the lower (28.000) or upper (29.699) frequency limit and tune continuously through all of the four segments. The result is that if you are scanning with the but-

Photo C. The Uniden HR2600 with the top case half removed. The six-position dip switch for CTCSS programming is at lower center.

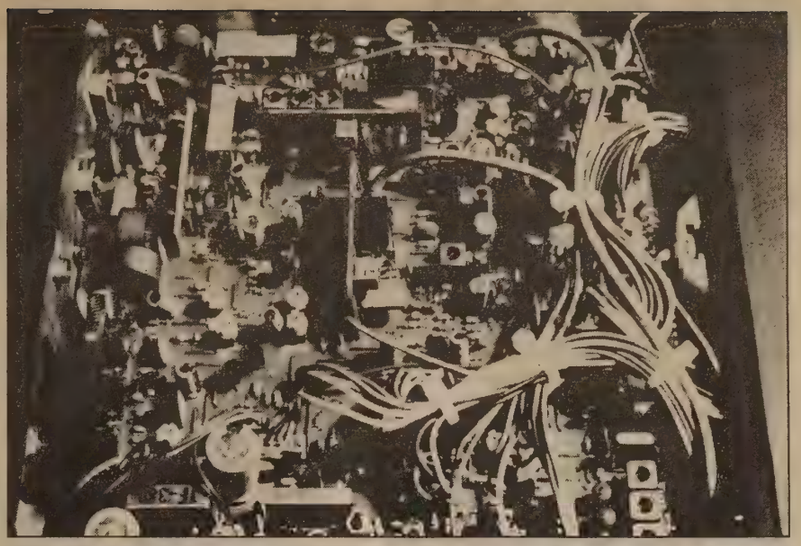

Photo D. The Uniden HR2600 with the bottom case half removed. No surface mount components here, but it's a tidy arrangement with easily accessible test points.

tons when you get to the end of one segment, i.e. 28.499, you can release the button, turn the VFO knob one click and then begin scanning up at 28.500. It works quite nicely in practice. By convention USB is used on the 10 meter band so there is not really too much use for LSB, although it can be used legally.

I have operated on CW, USB and FM modes and have found the receiver to be very good indeed. On sideband it compares very favorably with my Collins 75S-3. My subjective tests consisted of tuning the same station on one and then the other and comparing them by switching back and forth. No comparison was made on FM because I don't have that capability on the 75S-3. The RIT gives about 3 kHz range from max low to max high. I cannot report on the noise blanker because I haven't operated the rig near a pulse-type interference source such as an automotive ignition system. The S-meter is as accurate as most. Maximum audio output power is 4 watts. Receiver operation draws 500 milliamps squelched and 1 amp at max audio power.

In transmit mode, I have generally been able to "work 'em if I can hear 'em," and with good signal reports. The audio reports using the stock mike have been good also. The manual states that output power on CW is 25 watts, on SSB 25 watts PEP and 10 watts on AM and FM. My Drake wattmeter told me that I was putting out 30 on CW and about 12-13 on FM. Power requirements according to the manual are 3 amps on CW and AM and FM. I have not operated the HR2600 in AM mode.

The various meter modes are pretty straightforward, except for "modulation." This function, although very valid, conjures up the vision of a couple of good 'ol boys comparing the output of their illegal 11 meter linear amplifiers. Uniden has a strong background in the Citizens Band area and so that probably explains why *this* meter includes a modulation readout. It *can* be put to use as an indication of how close or far away from the mike you should be, especially in SSB. The S and RF output functions are the usual LCD segments. To use the SWR CAL and SWR modes, a steady carrier is required so transmit output must be in CW, AM or FM. The key can be used in CW or the Tx control in the other modes. After calibrating the meter using the calibrate control to make the bars light all the way to the mark, switch to the SWR setting and read it directly from the meter up to a max value of 3.0:1. There is some output power foldback if the SWR goes above 2.0:1.

Manual

The manual is quite complete and includes a complete schematic diagram of the rig. The impression here is that in its original drafting the manual was written in English, although the rig was assembled in the Philippines. Text, photos and diagrams are very clear and the information is presented in a systematic and useful way. The technical specs are included, as is a brief troubleshooting scheme. A brief outline of how to enter into amateur radio is included, along with reference to the ARRL as a source of answers to any questions. The schematic is complete but printing is quite small. Resistance and capacitance values and voltages are all readable but just barely. The manual is thin but complete.

During this period of sunspot doldrums on the higher HF bands you might not consider the purchase of a dedicated 10 meter transceiver, but hey, don't rule it out. I turn the HR2600 on often and scan through the various band segments and I'm surprised at the activity that can be heard. In CW mode, 25 watts is substantial output power and will often allow contacts at surprising distances. Transequatorial openings to South and Central America and the Caribbean occur with some frequency and CW is the ideal way to make the best of them. One of my real thrills with this little rig was working my first 10 meter FM repeater. I was tuning around on FM and heard several repeater QSOs going on. After listening for some time I learned that the repeater was in the Boston area. (The author's QTH is Montana.) At the conclusion of one of the QSOs I called one of the stations and was surprised to get a response. Under current conditions and at that distance you must make the exchange quickly. I have since worked some other 10 meter FM repeaters and look forward to the upcoming good propagation three or four years hence.

So, if you want to have a little unusual fun during the sun spot minimum and also be ready to work the world on 10 when it gets good again, I would recommend this radio. It's priced right and works well. How can you go wrong with that combination? RF

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Cutting Antennas to Resonance

Continued from page 19

cy and is 2:1 or 3:1 at the best, this is not a bad compromise. It indicates factors at work which may be beyond your control, but a dip does indicate you've at least tuned to resonance as best you could. I've used antennas with a 100:1 measured SWR (5000 ohms impedance and highly inductive) and worked all over the world with them, as long as transmission line losses were very, very small. A good example of this is my 134'-long end-fed wire antenna. At 3.5 MHz, its SWR measures (literally) 100:1. But if I plug it directly into my transmitter (no feedline at all), I can load into it and make worldwide contacts. Although this antenna represents a terrible mismatch at 3.5 MHz, it *is* resonant (half-wave, end-fed) and very efficient, especially when no feedline is used. If a section of 50-ohm coax had been used to feed this end-fed wire, even a very short section, the antenna's efficiency would be reduced to nearly zero, due to the parallel capacitance of the coaxial cable. You don't have to understand all this. Just try it.

Simple, huh? Now, once you're close, you know how much to cut or lengthen your dipole (or whatever) to adjust its resonant frequency. Remember, if you want to lower resonant frequency, you need to make your antenna *longer*. If you want to raise resonant frequency, you need to make your antenna *shorter*. If you cut a dipole "per the formula" and install it less than one-half wavelength above ground, chances are it will be too long and you'll have to cut it shorter. And now you know by how much.

Happy trimming! RF

Table 1. Change in length of half-wave dipole vs. change in resonant frequency.

160 meters	**13′0″**	**to change 100 kHz (6′6″/leg)**
80 meters	**3′4-1/2″**	**to change 100 kHz (20-1/4″/leg)**
40 meters	**11″**	**to change 100 kHz (5-1/2″/leg)**
30 meters	**2-1/2″**	**to change 50 kHz (1-1/4″/leg)**
20 meters	**2-3/4″**	**to change 100 kHz (1-3/8″/leg)**
17 meters	**1-3/4″**	**to change 100 kHz (7/8″/leg)**
15 meters	**1-1/4″**	**to change 100 kHz (5/8″/leg)**
12 meters	**7/8″**	**to change 100 kHz (7/16″/leg)**
10 meters	**11/16″**	**to change 100 kHz (11/32″/leg)**

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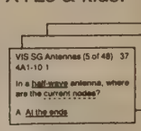

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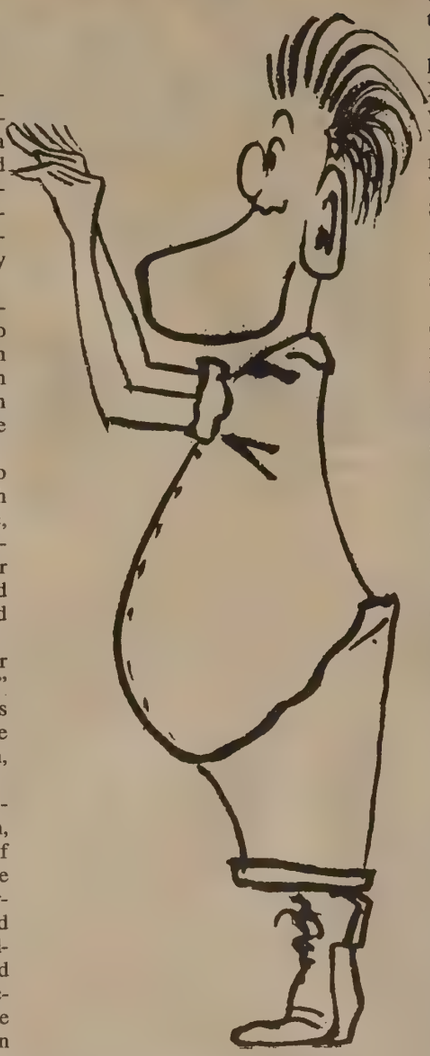

"OH NO! NOT AGAIN!!!"—with a nauseating SSSHHHGGLLOPP!!! one-sixth—or roughly one hefty handful—of a Sara Lee chocolate meringue cream pie whizzzed past my head and came to rest on my sound-absorbent wall covering and, in the process, on my T/R switch, a new RCC certificate and an autographed 8 X 10 glossy of my hero, J. Croyden Seymour.

[Poor 'ol J. Croyden! He was instrumental in interesting me in amateur radio and assisted in the planning of my ham shack. Regrettably, he was prevented from seeing the completion process-having been struck down in one of the most bizarre accidents in homo sapien history.

It seems that a jilted young lover, who lived nearby, had decided to do away with himself by swallowing something toxic, then speeding to the home of his unrequited love, dramatically expiring on her door step. Unfortunately, he arbitrarily grabbed the first bottle in the medicine chest and ingested 2.9 litres of castor oil.

On the way to his destiny, the young lover was overcome by that "irresistible urge" and breaking all records for the Fat Man's 4:40, he sped into the men's room of the nearest gas station (appropriately enough, it was a "Flying 'A'" station).

At that precise moment in time, the hapless J. Croyden, an extremely frugal man, was attempting to climb under the door of the only vacant pay stall in the place. The jilted lover plunged headlong for that particular door, deposited his dime and attempted to gain entry. Since he was standing on J. Croyden's spine and the door and floor were making rapid and repeated staccato contacts with J. Croyden's head, the jilted lover couldn't get in and J. Croyden couldn't get up.

The jilted lover, loudly bemoaning his fate, was doing what appeared to be a combination "War" "Rain" and "Put out that damned fire" dance all over J. Croyden's prostrate form. J. Croyden, being alternately pounded on the jawbone by the floor and the cerebellum by the metallic door was gurgling, "I'll pay-I'll pay—dammit I'll pay!"

Within a very short span of time, some other highly predictable events took place—none of which are relevant to the story save that they left J. Croyden with some odd residual inhibitions.

Since that day, his spare time is spent wandering around town with a harried look on his face, putting coins into pay phones, parking meters and gum-ball machines, keeping up a continual mumble of "Ya can't beat 'em! Ya gotta pay!—Ya just gotta pay!!"

At one time, unable to find a coin slot, J. Croyden just up and swallowed a fistful of coins—he lay in a hospital bed for three days before there was any change.

J. Croyden's family tries to keep him home as much as possible, not only to save money but because every time J. Croyden hears unexpected running footsteps behind him, the Fire Department must invariably be called to rescue him from the top of the nearest telephone pole, street sign or some precarious window ledge.

All this flashed through my mind as I watched the artificially colored meringue oozing, like some science fiction glob, onto my SWR bridge, Vibroflex and G.E. Clock/Timer. I knew, with that instinctive inborn canniness of the long-married ham, that I—through my interest in amateur radio—had somehow irked my wife. Had I forgotten to take out the garbage? Overlooked an anniversary? Forgotten our 12-year-old kid's—whozzis's—name?

I didn't turn my head—uh uh—oh no! The last time I did that, I kept right on talking and brought my D-104 along with me. The second salvo consisted of a two-week-old bagel which made forceful and direct contact with the D-104—driving it and my partial plate half way to my esophagus. It took an hour and a half to get pieces of the D-104 out of my teeth and another hour to get pieces of my teeth out of the D-104.

"Sweetheart," I said, "I wish you'd correct for windage—that's the third clock you've hit since Newton Minnow's birthday. The clerk at the Radio Shop almost called the 'foam rubber taxi' the last time I asked for a 'meringue-proof' clock!"

"RAAWWKKK!!!!!" screamed my wife—or some close approximation thereof—and another fragment of Sara Lee's epicurean delight found a spot dangerously close to the intake vent of the air conditioner.

"You never take me anywhere!" shrieked the distaff side.

"I do too!" I expertly reparte'd. "Why only last year I took you to the Anti-Lockjaw and Tongue Wagger's combination picnic, convention and orgy."

"Oh shhure, you take me to those alphabet soup affairs. 'You're the ho hum . . . How are the harmonicas?' and 'So you're YSD's XYZ?' "

"You got it all wrong, dear; I'm the O.M.—the kids are the harmonics and you're the XYL—L, not Z," I calmly replied."

"RAAAAWWWWKKKK!!!! Ho hum—O.M.—harmonicas—harmonics—XYL, XYZ, ABC, CBS, PDQ, who knows, who cares! I feel like I'm at the Podunk Valley grammar school refereeing the semi-finals of a Sanskrit spelling bee—I WANNA GO MEET PEOPLE WHO SPEAK WHOLE WORDS!!!!"

"Okay," sez I, "How about the night I took you to Howard Johnson's for dinner and cocktails?"

ZIPPLINGGG!—the empty pie plate caromed off my hand key, ricocheted into my message blank file and came to rest, face down, atop the head of our jittery, goggle-eyed poodle, who took off like a hairy hippie midget—a little more jittery and definitely more goggle-eyed.

"Howard Johnson's! Howard Johnson's! *Howard Johnson's*—what a night that was. All the way there and all the way back you kept hollering into that junk you got stuck under the dashboard—'I'm mobile—I'm mobile'—you got so much stuff under the dashboard that I have to ride in the back seat . . . "

"But lover, you keep kicking holes in my speaker . . . "

"I'll kick holes in your head, you cuckoo!!! And another thing—If you say, 'I'm running mobile in the car tonight with a *hustler'* one more time, boy, and . . ."

"But dear," I said, "that's the name of the antenna."

"Antenna smantenna! Just one more time and you'll be talking to a divorce lawyer with a carved 'Z' on your forehead and that stupid antenna hangin' out of your navel!"

Drawing another breath, she said, "Do you remember what happened when we got to Howard Johnson's? I'll tell ya—you inhaled two martinis, tap tapp tapped your way through half the meal with your swizzle sticks then commandeered the paging system microphone and called CQ into a crowded restaurant and made two contacts—one, a nearsighted insurance salesman who spent a goodly part of the evening trying to sell policies alternatively to a hat rack, the juke box and the post card rotisserie; and the other was an itinerant 'dirty book' salesman—(You sure he had mobile gear in his trunk?) Anyway, you spent the rest of the evening talking alphabet soup at the table.

"Why, we can't even have people over for an evening!"

"That's not so darlin'. We had the Carsons over just two weeks ago." I retorted, slyly trying to slip my son's whatziz-name's football helmet over my head and earphones.

"That was another terrific evening," my wife blurted. "First, as they came through the door you started off with 'hi there, you've met my Wife, *W*hiskey, *I*ndia, *F*oxtrot, *E*cho, Wife, and my oldest daughter, Linda, *L*ima, *I*ndia, *N*ovember, *D*elta, *A*lpha, Linda, haven't you?' Then we later tried to watch TV, but you got off on UHF, VHF and TVI—more alphabet soup—then Harry started telling jokes and you brought out an old electronics magazine, opened to a dog-eared page and sat there roaring for a full 15 minutes at the title alone—I still don't see what's so funny about an article entitled, 'HOW TO MOUNT AN OSCILLOSCOPE!' "

"And you kept calling Harry a stupid 'top' all night!"

"That's *lid,* dear," I said.

"Top, cover, cap, lid whatever . . . did you have to throw him out of the house just 'cause he asked if you could pick up police calls on your ham rig?"

"It wasn't just that, honey—but when he asked, 'How far will this thing pick up?' I told him 'exactly halfway around the world in any direction' and he didn't even chuckle!" sed I.

"I could even take this stuff on a part-time basis, Bob, but last night you phoned and said you wouldn't be home until a hundred sixteen Swahili—I never know what the hell you're talking about . . . "

"That's 'sixteen hundred *Zulu,* sweetheart' "

"Swahili, Zulu or Watusi—what the hey—they're all members of the Bantu Nation. How come you can't just say 'four o'clock'?"

I was saved at this point by the ringing of the doorbell.

"Come in!" I yelled overly loud and a little hysterically. The door opened and J. Croyden ambled into the shack and, with a 'clunk,' deposited a nickel into the piggy bank we had installed just inside the door for just that purpose. "Ya gotta pay, old son," said J. Croyden, and began to survey the shack as my wife headed for the kitchen.

Noticing the Sara Lee ingredients dripping on, over and around various pieces of equipment, he said, "Well, either someone sent you a chocolate parfait time bomb or you been having troubles with the XYL again."

"No initials puuleeease! I'm in enough trouble already, J. Croyden!"

"Sorry, son, . . . ('clunk,' another nickel) . . . What started it off?"

"Well," I said, wiping chocolate goo out of a phone jack—"I guess I forgot an anniversary—or I haven't been paying enough attention to the wife—or some foolish thing like that—last year it was because she wanted a 'second' dress!"

"Tough," said J. Croyden—searching for another coin—finding none, he wrote out an I.O.U. and stuck *it* into the piggy bank.

"I suppose it all started when my mother-in-law was here. She looked up at my tower and tribander and asked what it was—so I told her it was a clothesline for the Jolly Green Giant—Ya know what I wish, J. Croyden? What I really wish?

"Whazzat?"

"I wish to hell I had a way of ending this article—that's what I wish!"

"There is no end, old son," said J. Croyden "It's a vignette!"

"MONDO HAMME—It's a Ham's Life . . . " RF

Reprinted from the June 1969 issue of 73 Magazine.

the tech side

by Michael Jay Geier KB1UM

Good Buying

For the past few months, we've been looking at the various kinds of commercially available ham radio gear. This time, let's look at low-power (QRP) rigs, and then finish with a peck at power supply issues.

QRP

QRP is defined as having less than 5 watts of transmit output power. That doesn't sound like much, but you can work the world with it! Although there are a few QRP voice rigs, the overwhelming majority of low-power sets are for CW (Morse code). There are several reasons: It's cheaper and easier to do than other modes, and it takes very little signal at the receiver for you to be understood, taking good advantage of the available power. Also, the low duty cycle (transmit on/off ratio) keeps the final amplifier simple and small, and reduces power consumption for battery operation. Many QRP rigs can be had new for under $250, with some below $100. Although they're very stripped down, some of them are well-designed and have darned decent receivers. Of course, if you don't like CW, you probably won't be too enthused about QRP, especially with the poor propagation on the bands these days, which makes low-power voice operation unlikely. I think most newcomers will be happier with more powerful first radios. You can always try QRP later on. In fact, some very seasoned hams love it, letting their big rigs and linear amplifiers gather dust while they pound their calls on keys connected to tiny boxes.

While bigger HF radios are very polished, consumerish devices, QRP is a whole 'nother ball game. Sure, you can buy a finished, ready-to-go QRP rig, but many QRPers are builders and experimenters, so there are plenty of other choices. You can buy various QRP kits, including separate transmitters and receivers, as well as complete transceivers. Often, the rigs are for only one or two bands. Many hams like to build small transmitters (which are far easier to make than receivers) and use them with commercial receivers. That may sound like the easy way out, but it actually has a long tradition; even many years ago hams were avoiding making receivers, because the commercial units were generally so much better than what most people could build at home. Of course, some hams take great pride in making fabulous receivers, and I applaud them. But, don't feel bad if a double-conversion superhet receiver seems a bit daunting; it genuinely is! I've yet to build a really complex receiver from scratch, though I hope to some day.

Those kits are a great way to learn and wind up with a nifty rig. With a kit, you can indeed make a very nice receiver, along with a transmitter with up to 5 watts output, which is the official limit for anything classed as QRP. Can you really be heard with 5 watts? Believe it or not, hams have worked the world on milliwatts! When the bands are good, 5 watts are more than enough, at least on CW. Heck, I remember talking one night on my big rig from Vermont to New Jersey, on 75 meter SSB voice, with my power accidentally turned down to about 2 watts. I was on for a good 15 minutes before I realized what I'd done, and nobody on the other end was the wiser; I was still 10 dB over S9 down there. So, yes, you sure can make contacts with low power. But why bother?

BIFTY

Because It's Fun, That's Y! Imagine yourself out in the forest or a campground, in a tent, with a tiny rig running on D cells, and some wire strung in a nearby tree. You pop on the headphones (we don't want to disturb the wildlife, do we?), twist the dial and, next thing you know, you're in contact with someone in the Ukraine. Can that really happen? You bet—in fact, it's fairly routine when the bands are hot. And you sure couldn't do it with a full-sized rig. First of all, you wouldn't carry the thing out there. Second, you couldn't power it; making 100 watts of RF output takes a ridiculous amount of current. Just for a lark, I once tried powering a 100-watt rig from a 2 amp-hour VCR gel cell battery. It worked for about five minutes. And, after a couple of attempts, it destroyed the battery. Nope, out in the field, QRP is the way to go.

As I mentioned, though, the bands are often less than hot these days. Does that mean you should avoid QRP? Not at all. Just be aware of present limitations and don't expect miracles. You'll still have plenty of opportunity for contacts, but many may be stateside. So what's wrong with that?

Choices

All modern, full-sized radios offer superhet receivers and fine performance. Most offer all or most of the ham bands; QRP rigs, though, have a much wider variation. Some use direct-conversion receivers instead of the more familiar superhet. In a direct-conversion receiver, incoming signals are mixed with a local oscillator at the same frequency, which converts the signal directly to audio, rather than to some intermediate frequency (IF) for further processing. While D-C receivers are very sensitive, they also have serious limitations. The biggest one is that you hear signals on both sides of your tuning point, so you hear twice the QRM (interference). Also, if you're not careful, you can be tuned to the wrong side of the signal, which will cause your transmitted signal to be so far off frequency that the other operator will never hear your call. Thanks to that lack of IF processing, D-C receivers also don't have the selectivity we've come to take for granted with superhets. Further, the D-C circuits tend to be microphonic, meaning they are sensitive to vibration. Consequently, most don't have speakers in the same box, because the vibrations from received signals will cause feedback howls; you must use headphones or a separate speaker. Wait, there's more: D-C sets usually work poorly with AC power supplies, no matter how well the supply is filtered. The problem is an obscure phenomenon wherein the power supply re-radiates a hum-modulated signal, causing terrible hum in the receiver. The best way out is to use batteries. Despite all of this, DC receivers are so popular in QRP gear because they're cheap and simple, and they can be remarkably sensitive and quiet; with a weak signal, a D-C receiver can sound better than most superhets. Still, better kits and pre-built radios are starting to use superhets, some with sideband filters and everything. So, should you avoid a D-C receiver? Not necessarily. I've built a few and had great fun with them.

Power!

If you're going QRP, you don't need a lot of power. Figure on your radio's taking about twice the power in that it puts out. So, a 5-watt output will require about 10 watts. At 12 volts, that's still less than one amp, and alkaline D cells should run the radio for quite awhile. After all, you only use that 10 watts during actual RF output. Even during the spaces between CW elements, the rig idles and doesn't use much power at all. And, in receive, the power drawn has nothing to do with transmit output power. Most small receiver circuits take well under 1 watt to operate.

For one of those stripped-down 10 meter radios, you'll need a few amps of current. Figure on 3 to 5 or so. You can buy or build a power supply of that capacity for not much money, or you can go with gel cells or even NiCds. You'll often see gel cell VCR and burglar alarm batteries in the 2 to 10 amp-hour range at hamfests. Most are priced very cheap. If you want to buy one, though, bring a voltmeter and check it first. If the battery is way below its stated voltage, it probably is too far gone to accept a charge, and is useless. Don't ever let anyone tell you "all it needs is a good charging." As for NiCds, I wouldn't buy them at hamfests; old NiCds are almost always bad and a total waste of money.

For a full-sized 100-watt radio, you're gonna need some juice! Most rigs made today need a maximum of 20 amps at 12 volts. That's a wallop. Forget gel cells and NiCds. You need either a fairly hefty AC supply or a car or marine battery. Figure on spending between 80 and 100 dollars on a new AC supply. While you can use a car battery, they don't take well to deep discharges, so you'll need a charger floating across the battery. Just be sure the total voltage doesn't exceed the rig's rating. A marine battery works better, because it is designed to be run way down between charges. Note that I don't mean a marine starting battery, which isn't much different than any car battery; I'm talking about the deep-discharge type used for electric trolling motors.

If you do use a lead-acid battery of some kind (other than a sealed gel cell), never use it indoors. Those things just weren't intended for indoor use, and the fumes can be dangerous, and can even explode! It just isn't worth the risk.

Well, I think we've finally about covered the basics of buying radio gear. I hope you'll build something one of these days, because it's a blast. We all buy plenty of gear, though, and I hope this has helped you to make more satisfying choices. Until next time, 73 from KB1UM. RF

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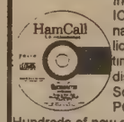

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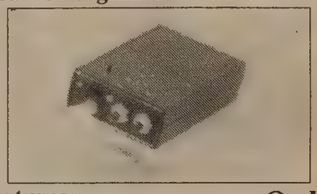

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radio magic

by Michael Bryce WB8VGE

Kit Building

Looks like Santa must have had a lot of kits in his bag this Christmas. Judging from the amount of letters I've received asking about the proper way to build and solder kits he was indeed busy!

Although I've talked about this in this column before, perhaps it's time to expand on the art of kit building. I always enjoy building electronics kits. It's fun, relaxing, and the end results are always pleasing. Let's dig in!

Installing the Parts

Most of the kits you'll run into today are nothing more than a plastic bag full of parts. The instructions are usually very shallow or nonexistent. The assembly instructions will either make or break how a kit goes together. Plug your soldering iron in and let's get moving.

The first thing you'll install will be the resistors. That's because there are so many of them. I've talked before about what a resistor looks like and how to read the color codes. You don't need to know the entire resistor color code, but you should be able to spot the 10k and 100k resistors in the pile. If you can't, then make a stop at your local Radio Shack for a resistor code card. They're about a buck or two. Just dial up the color you want or the value you want and the card will display either the color codes or the value for the color code.

I've noticed something a bit different in the last several kits I assembled. Instead of having you install the resistors one at at time, you're told to install all the 10k resistors, then all the 100k resistors, all the 470-ohm resistors and so on until you have them all stuffed on the PC board.

I like to install the resistors so the color codes are all pointing the same way. It's much easier to find a misplaced resistor should the need come up this way.

Most of the resistors you'll be installing on your PC board will be the 1/4-watt size. Be sure to place the resistor firmly down against the board. Don't allow the resistor to stand up from the board by even the smallest amount. Long resistor leads in certain types of RF circuits will add unwanted inductance to the tuned circuit, making them hard to adjust and align. In some cases, there may be enough extra inductance to cause the circuit to not operate at all! Keep those resistors down flush on the board with one exception—high wattage resistors.

You should mount high-wattage resistors above the PC board. About half an inch or so above the board is a good start. When I mention high wattage, I'm talking about resistors over 1 watt. You want to keep these guys cool by allowing air to move around them. If you mount them down against the board material, they'll overheat to the point of burning the PC board material. Although I mentioned long leads just a few minutes ago, it's normally not a problem with large-wattage resistors as they will be used in power supplies, audio amplifiers, and other non-RF applications. Of course, there's alway the exception. If in doubt, contact the kit manufacturer.

Large silicon diodes over one amp are mounted the same way—keep them off of the board by at least half an inch. These diodes are just like the higher-wattage resistors—they need to be kept cool by air moving around their cases. Alway install the diodes with the banded end of the diode placed against the outline on the PC board or its part overlay.

Small signal diodes should be mounted like the 1/4 watt resistors, down flush against the board. Be mindful of the banded end of these smaller diodes as well.

Capacitors are a pain in the butt. They must be installed correctly the same way as diodes, but they're marked differently. Some electrolytic capacitors mark the positive lead while others mark the negative lead. Pay attention when you're installing electrolytic capacitors. One value from one company marks the positive lead while another value capacitor from a different company marks the negative lead. Tantalum capacitors are especially nasty about their marking changing from one company to another. This is especially true if the kit is using surplus capacitors.

No matter what the component is, spread its leads so they exit the other side of the PC board at an angle. Don't bend them down flush on the copper side of the board. Doing so will almost guarantee a solder bridge between traces and pads.

Don't add things to the circuit unless you know what you're doing. Don't use IC sockets unless you know for a fact you can. Circuits running at RF can be unraveled by using just one IC socket.

That about covers the major points of stuffing the PC board. The next problem is soldering. It must be done correctly or all your work is for nothing.

Soldering

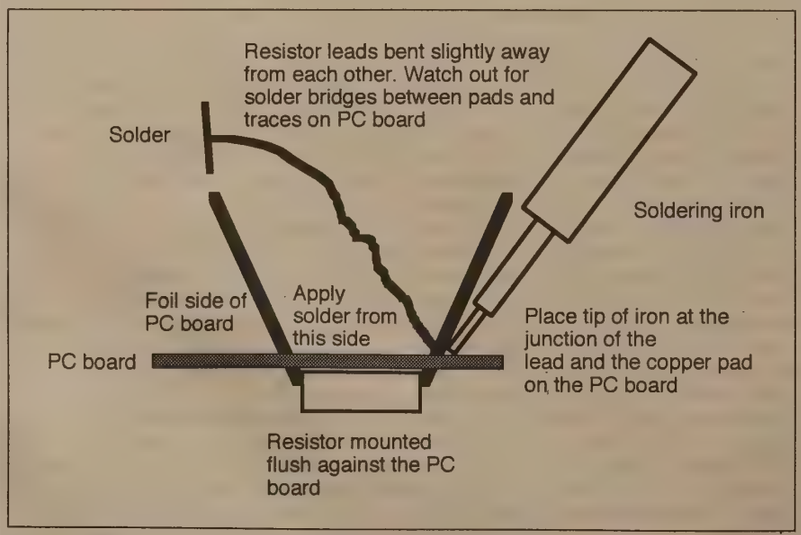
Soldering is a lot like cooking. You need very clean conditions, and lots of heat. Every connection, every solder pad must be clean and shiny. If it is not, then the solder will not flow on the joint. If the PC board is bare copper, then take a small sheet of very fine emery or sandpaper to clean up the copper traces. Don't use steel wool. The loose wool can cause problems between the traces and pads if you don't clean them out entirely. In a pinch, you can use the rough side of a sheet of heavy paper to shine up the copper. If the PC board in your kit has what is known as a plating on the copper, then *don't* remove it. It's there for a reason: to help make the solder flow easier. The term solder reflow is often mentioned in certain kits. This means the PC board's copper has a small amount of solder applied to the traces and pads. Soldering on a PC board with reflowed solder is a delight!

After you have the copper all shined up, don't touch it with your fingers. The oil on your hands will cause the copper to oxidize and prevent the solder from flowing. Now comes the fun part!

Take your hot soldering iron tip and place it on the copper pad on the PC board. Allow the tip to just sit there for a second or two, heating up the copper pad, with the lead poking through it. Next, apply a small amount of solder to the opposite side of the soldering iron tip. If all is right in the world, the solder will melt as soon as it touches the lead and copper pad. Now, stop applying solder and allow the joint to sit for a second, with the soldering iron tip still on the joint. Next, remove the soldering iron. The joint should be nice and shiny. If the joint looks like a glob of sand or the solder is all bunched up on the lead, then reheat the joint and apply a touch more solder. It should take about three to four seconds per solder joint when you're working with a PC board. Soldering is a lot like a fat women on a set of bathroom scales—get on and off as fast as you can without anyone seeing you.

If you plan on doing any amount of kit building, then you will need a good soldering iron. Soldering irons come in all sorts of styles and power. Get one that is comfortable in your hand and has enough ummph to get the job done. Having an under-powered soldering iron will cause more damage than a higher-wattage iron. I use several different wattage irons. I prefer to use a 40-watt iron for faster soldering and a 23-watt iron for secondary projects. For surface mount components, I have an Antex 18-watt iron with a micropoint tip. The Antex iron is one of my favorites. Even though it is rated at only 18 watts, the amount of heat it produces equals a 25-watt iron. Best yet is its fast operating time: from dead cold to 800 degrees in about 15 seconds.

Next month is Field Day, so I'll show you two of my all time favorite Field Day antennas. RF


Resistor leads bent slightly away from each other. Watch out for solder bridges between pads and traces on PC board
Solder
Soldering iron
Foil side of PC board
Apply solder from this side
Place tip of iron at the junction of the lead and the copper pad on the PC board
PC board
Resistor mounted flush against the PC board

Soldering on a PC board.

antennas, etc.

by Joseph J. Carr K4IPV

Are you afflicted with limited space for antennas? For most of us today, that question is a little bit like asking: "Does a bear mess in the woods?" or "Is the Pope Polish?" Of course, the vast majority of us face some limitation or another because of the real estate on which we live. Some people face really restrictive situations because of townhouse living. Not only do townhouses lack any semblance of an antenna-friendly yard, but they are also totally devoid of antenna-friendly homeowners' associations. Others live on the standard quarter-acre lot which may or may not (usually may not) allow anything as big as a 75/80 meter dipole. For that reason I've used verticals for a number of years. Most of us will face space limitations at one time or another. We can't all be as lucky as my friend, the late Johnnie H. Thorne K4NFU/5, who owned 47 flat Texas acres with a 1,200-foot property line (ask me to tell you about his longwire sometime). For the rest of us, we must either stay on the higher frequency bands, go mobile . . . or build some sort of compromise antenna.

First, let's discuss that word "compromise" a little bit. Will these antennas perform as well as a half-wavelength resonant dipole (or "dipole" for short) antenna? In a word: itznotlikely.

Two things are usually given up when size compromises are made in antenna designs. First, one tends to give up a bit of bandwidth (i.e. the region over which the VSWR stays within bounds that don't need to be tuned out—a naive but useful definition). At least one source says that the bandwidth loss is approximately proportional to the size reduction compared with the dipole.

Second, one tends to give up a bit of effectiveness compared to a properly installed dipole. You don't "get out" as well. But, as I told my out-of-work friend, who was grousing over a low-paid temporary job, " . . . some income is better than no income." No, the compromise antenna will not usually perform as well as a properly installed dipole, but it may well approach dipole performance; besides, being on the air with some signal is better than being off the air with no signal.

By the way, I've been afflicted with compromise antennas for much of my ham life, and have been pleasantly surprised many times. Besides, racking up an impressive score of QSOs is less a function of hardware than brainware . . . operating skill and patience usually count far more than a lot of expensive gear. I remember one guy, back around 1960, who strapped a Hy-Gain 14AVQ antenna onto the balcony rail of a fourth-floor Washington, DC, walk-up apartment, and worked 250 countries on CW in two years, using a few scrubby watts from a Heathkit DX-20 transmitter and a World War II surplus BC-779 (Hammarlund Super-Pro variant) receiver.

The BentPole Antenna

Perhaps the most common form of limited space antenna is the bent dipole antenna, a.k.a. the "BentPole." The half-wavelength radiator is split into four sections: two are one-sixth wavelength ($\lambda/6$) and two are one-twelfth wavelength ($\lambda/12$). The shorter $\lambda/12$ wavelength sections are at the ends of the antenna, and are arranged at right angles to the $\lambda/6$ sections. The antenna will perform reasonably like a regular half-wavelength dipole, and you may be quite pleasantly surprised.

As with most antennas, one must usually tune the length to resonance for best performance. Start with an initial cut of

$$\frac{\lambda}{6} = \frac{160}{F_{MHz}} \quad (1)$$

and,

$$\frac{\lambda}{12} = \frac{80}{F_{MHz}} \quad (2)$$

These lengths will probably be close, but may be a bit too long. Trim equal amounts from the $\lambda/12$ ends until resonance is reached. A good VSWR meter, or an instrument such as MFJ's SWR Analyzer, will help you find the resonant point.

The $\lambda/12$ sections are vertical with respect to ground in most presentations of this antenna type. However, over the years I've found only small differences, and even those could be challenged on grounds that simple observations are not scientific, when the $\lambda/12$ sections were horizontal to the ground, or when one went one way and the other went the other way. While not a good practice, remember the admonition at the beginning of this article: Being on the air with some signal is better than being off the air with no signal.

A Different Dipole

Figure 2 shows a shortened antenna that uses 400- to 600-ohm parallel line for an impedance matching section, 300-ohm twin-lead the transmission line (caution: low power only), and #12 or #14 antenna wire for the radiator element. At least one person I know claims to have used 450-ohm twin-lead for the matching section, breaking it into two sections (L2 and L3), rather than tapping it as shown. I doubt that the lengths (L1, L2 and L3) would be the same for both twin-lead and open-line because there is a difference in the velocity factors of the two types of transmission line.

The length of the radiator element is:

$$L1 = \frac{335}{F_{MHz}} \text{ feet} \quad (3)$$

$$L2 = \frac{105}{F_{MHz}} \text{ feet} \quad (4)$$

$$L3 = \frac{29}{F_{MHz}} \text{ feet} \quad (5)$$

For 3.75 MHz, i.e. the middle of the 75/80 meter band, these translate to L1 = 89.3 feet, L2 = 28 feet, and L3 = 7.7 feet.

Antenna Safety

Antenna building is fun, and provides the ability to get on the air and have some real fun. Over the years that I've been writing for ham radio operators (since June 1968 when my first piece was published in *QST*) I've always stressed safety first. That holds true in antenna work as well as other electrical or electronic work. Several problems come to mind when thinking about safety and wire antennas:

1. Don't even think about tossing the antenna wire over a power line . . . it'll *kill* you!

2. Watch the wire and transmission line while working. I know one chap who did a header off a roof, breaking his pelvis and leg, because the #14 stranded wire he was cutting for a 40 meter dipole became entangled in his feet.

3. Keep the transmission line *disconnected* from the transmitter or receiver while working on the antenna. Many years ago we heard about a chap who was on the basement floor sitting on his parallel open transmission line, happily repairing some wind- and weather-damaged spreaders, when his little daughter turned on the *transmit* switch to his 150-watt Heath DX-100B transmitter. RF burns are a dog to heal!

4. Think about what you are doing before and during an antenna erection job. Most accidents can be avoided if a little planning and forethought are done.

Correspondence reaches me at P.O. Box 1099, Falls Church, VA 22041. RF

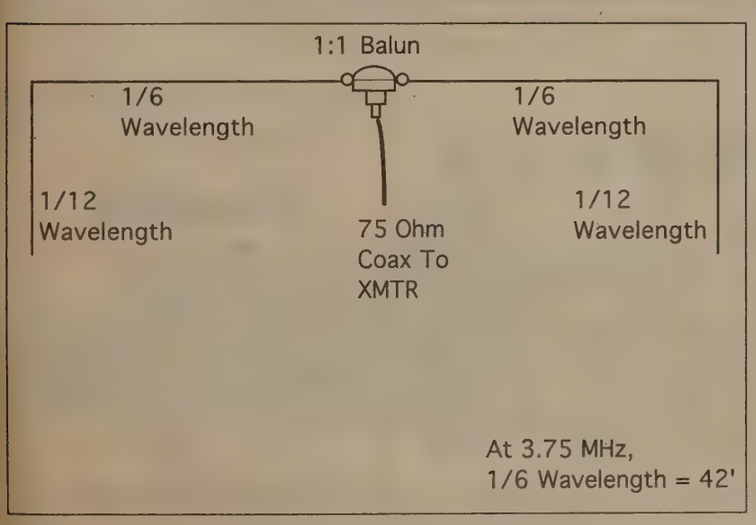


Figure 1. BentPole antenna.

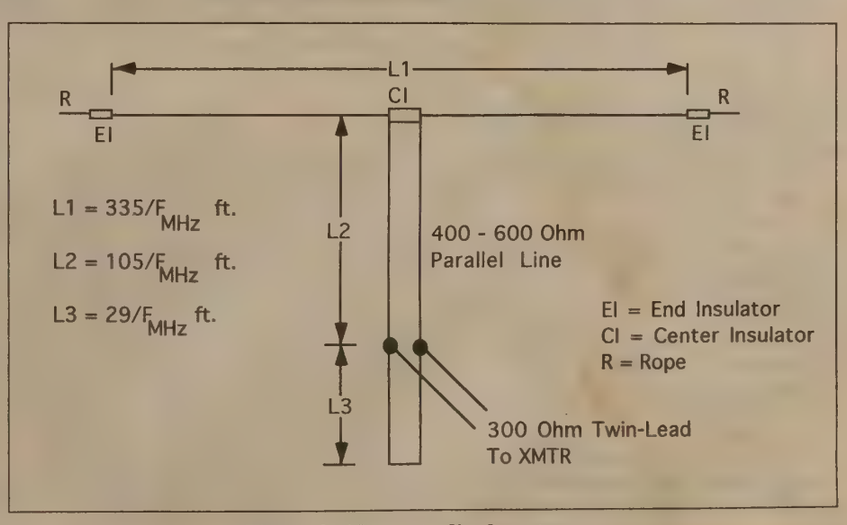


Figure 2. Alternate dipole antenna.

what's next?

by Carole Perry WB2MGP

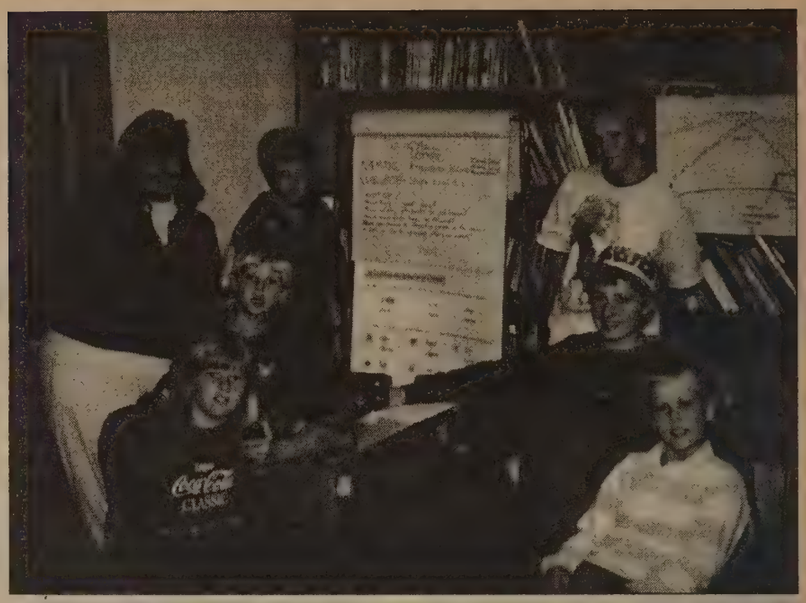


Photo A. Frenchboro School (Frenchboro Island, Maine) students around the rig with teacher Heather Hurlburt.

Lobsters and The Big Apple

For the past 15 years of teaching amateur radio to sixth-, seventh-, and eighth-graders at Intermediate School 72 in Staten Island, New York, I never cease to be amazed at the ripple effects we encounter from various radio contacts. When Jim Wilmerding N4MDC and I made our initial radio contacts between my school and a little one-room schoolhouse on Frenchboro Island, Maine, we never imagined the spin-off activities that both schools would become involved with.

As mentioned in my last column in this publication, our school sent hundreds of cultural exchange projects to the Island Institute, which services the educational needs of the 14 island schools in Penobscott Bay. When Jim had six live Maine lobsters sent to our school the kids went ballistic! A wonderful banquet lunch was arranged, complete with cooking lessons and press and TV coverage. But that wasn't the end of this incredible exchange.

During the second week of February, our school sent a package of local New York food specialties. A neighborhood delicatessen and restaurant called "Golden's" was so impressed with what the children were involved with that they donated a 25-pound box of delicious deli meats, salami, potato knishes, and other goodies. The children at our end were at the edge of their seats waiting to hear from their counterparts on Chebeague Island.

Our principal, Barbara Glassman, had spoken on the ham radio to Ron Cote, principal of Chebeague Island school, to thank him for his part in the terrific school exchange. She invited him to visit our school and told him to be sure to call us if they needed "instructions" on how to eat some of the more unusual foodstuffs we sent them. Sure enough, they did call us to have us identify what turned out to be a potato latke (potato pancake). We told them to heat it up, serve it with some applesauce, and enjoy!

It's been a few months since our "Lobster-Fest" but most of the children who participated are still talking about it. Many of the parents still drop by my room when they're at the school to reminisce about the exciting day they spent with their children at the "Lobster-Radio" luncheon. The nice thing about it is that all the fond memories are the result of reaching out to other children on the ham radio.

The photos that Jim sent me show the fun and excitement at the various island schools as they opened our packages and spoke to us on the radio. Jim and I both feel we gave these youngsters a real taste for ham radio. RF

Photo B. Jim Wilmerding N4MDC with Frenchboro Island students and teacher Heather Hurlburt and teacher's aide April Wiggins on the dock in front of the Institute's year-round boat, *Raven*.

Photo C. Islesford School students, with teacher Janet Fader at the mike, on Little Cranberry Island, Maine.

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upgrade . . . don't stop now

by Gordon West WB6NOA

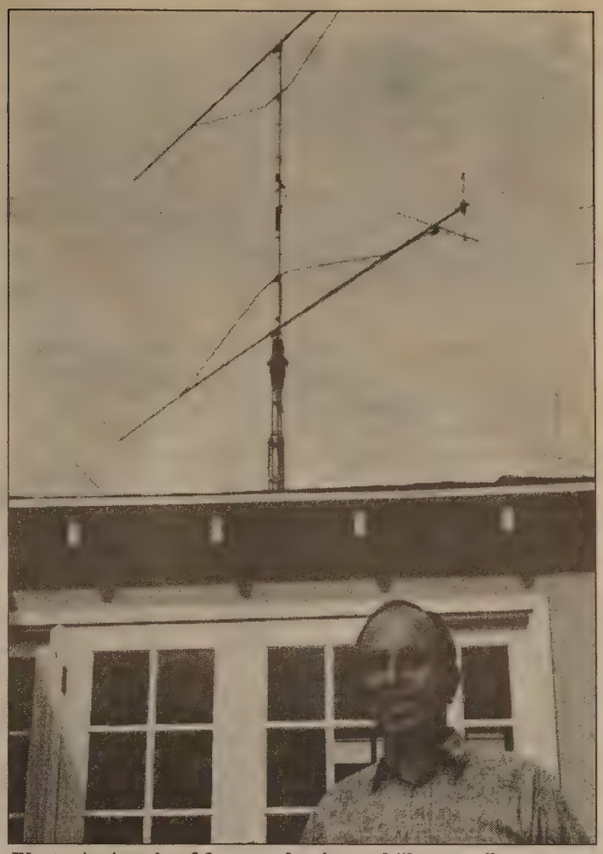

Photo A. A pair of 2 meter horizontal "boomer" antennas allowed Paul KH6HME to hear the West Coast on 144-220 MHz SSB.

Strange Sounds Below 144.300 MHz

The 2 meter band extends from 144 MHz to 148 MHz. Frequencies within that band are divided up into special usage areas, called the 2 meter band plan. The 2 meter band plan is a cooperative effort by amateur radio operators to put certain types of modes on certain frequencies—and to reserve certain frequencies for specific types of emissions.

Following the band plan minimizes collisions between packet transmissions, incoming signals from satellites, and the day-to-day communications through FM repeaters and FM simplex. Let's take a look at the 2 meter wavelength band plan as adopted by the American Radio Relay League, and accepted by the Federal Communications Commission, as the official 2 meter band plan:

MHz	Use
144.00-144.05	CW only, moonbounce
144.05-144.06	CW only, beacons and moonbounce
144.06-144.10	CW only, meteor scatter and moonbounce
144.10-144.20	Single sideband and CW weak signal—no FM
144.200	National single sideband calling frequency—no FM
144.20-144.30	Single sideband and CW only—no FM
144.30-144.50	FM simplex, plus new OSCAR sub—band
144.50-144.60	FM linear translator inputs
144.60-144.90	FM repeater inputs
144.90-145.10	FM simplex
145.10-145.20	Packet radio
145.20-145.50	FM repeater outputs
145.50-145.80	FM, packet, and simplex autopatch
145.80-146.00	Satellite SSB/CW only—no FM
146.01-147.37	Repeater inputs
146.40-146.58	FM simplex
146.61-146.97	FM repeater outputs
147.00-147.39	FM repeater outputs
147.42-147.57	FM simplex
147.60-147.99	FM repeater inputs

Throughout the country, each state may offer splinter channels for FM repeater use, either 15 kHz or 20 kHz separation, interspersed between regular channels.

There is *no FM below 144.300 MHz.* If you ever tried to listen below 144.300 MHz on a hand-held or mobile FM transceiver, chances are you probably didn't hear anything but noise. Or maybe you picked up some garbled sounds that never tuned in clear. Or maybe you heard the noise level going up and down, a little bit like CW but without a tone. This is normal—behind this seeming expanse of silence from 144.000 MHz to 144.300 MHz are the weak-signal sounds of single sideband and CW.

No FM is permitted, by the band plan, below 144.300. FM signals are also not permitted in the satellite section of the 2 meter band from 145.800 to 146.000 MHz. Even though you don't hear anything within this range, there may be plenty of activity taking place on CW or SSB.

Single sideband is the voice emission that you cannot tune in with your FM set, nor can it be easily detected over the airwaves. An SSB emission is typically 2.8 kHz wide, as compared to the 10 kHz that an FM emission uses. SSB is a form of amplitude modulation where the carrier is reduced by at least 60 dB down, and one sideband, usually the lower sideband, is eliminated. This leaves only a single sideband (hence the name, single sideband), and the single sideband has much greater capability of going over longer distances and being received by a very special type of SSB \radio which incorporates special circuits to recover the seemingly garbled and unintelligible audio.

> ***"The 2 meter band plan is a cooperative effort by amateur radio operators to put certain types of modes on certain frequencies—and to reserve certain frequencies for specific types of emissions."***

But good news—the single sideband receiver that is part of a single sideband transceiver (transmitter and receiver) only has one-third the amount of noise that normally comes in, allowing extremely weak signals that would ordinarily be totally buried in noise on FM to come through loud and clear on SSB.

At the bottom of the band, continuous wave is used by some amateurs to bounce signals off of the moon as well as off of meteors. CW is a constant carrier wave that is interrupted when the CW key is up. When the key is depressed, an unmodulated carrier wave (CW) goes out into the airwaves, and can be received hundreds and sometimes thousands of miles away by other stations with SSB/CW equipment.

All SSB transceivers can also send CW, and most can also send and receive traditional FM. However, FM is never allowed below 144.300.

Most FM transceivers can only work FM, and *cannot* receive CW or SSB. To do that, you may need to look at a new type of 2 meter transceiver called a multimode transceiver.

ICOM IC-275H base station - $1,900
ICOM IC-820H base station - $2,000
Kenwood TM-255A - $1,000 mobile
Kenwood TS-790A - $2,000 base station
Yaesu FT-736R - $2,200 base station

Those big $2,000 base stations also operate single sideband on the 430-440 MHz band, too, as a complete satellite uplink and downlink station. And, if you shop around at swapmeets, chances are you can find a 2 meter and sometimes 2 meter/440 MHz SSB multimode transceiver at around $500.

Most SSB and CW operators who operate below 144.300 use horizontal polarization for long-range simplex contacts. Horizontal beam antennas and horizontal loop mobile antennas are popular, and simplex contacts are common over 200-mile and 300-mile paths. That's right—SSB allows for extremely long-range hard base, base-to-base, and car-to-car communications, more than five times what you could get on FM simplex.

And SSB operators also have their own "repeaters" called OSCARs—Orbiting Satellites Carrying Amateur Radio. Polarization is usually from a beam antenna that emits a circularly polarized wave, and these beams must be aimed at the passing satellites in elliptical orbits for some phenomenal 3,000-10,000-mile contacts! OSCAR satellite communications take place between 145.800 MHz-146.000 MHz, and with an SSB set you can easily hear the satellite beacons at 145.810 MHz. You cannot hear them with a straight FM set.

So does this mean that FM is no good on 2 meters? Absolutely not. FM and packet radio are the backbone of 2 meter communications. However, if you're looking for a range boost, and enjoy the exploration of propagation at power levels usually no greater than 50 watts, consider stepping into single sideband and getting yourself a beam antenna for some extraordinary results. And when conditions are just right, it's possible to talk SSB from point to point well over 1,000 miles away, too!

Just remember, no FM transmission is allowed between 144 and 144.300 MHz, and no FM is allowed between 145.800 and 146.000 MHz. These two subbands are reserved exclusively for single sideband and CW. Please give these operators a break and never operate FM on these frequencies reserved (and enforced by the FCC) exclusively for weak signal SSB and CW. Come on down and join us, too—there's plenty of room on SSB, and all you need is the no-code Technician Class license or higher to get in on all the fun. RF

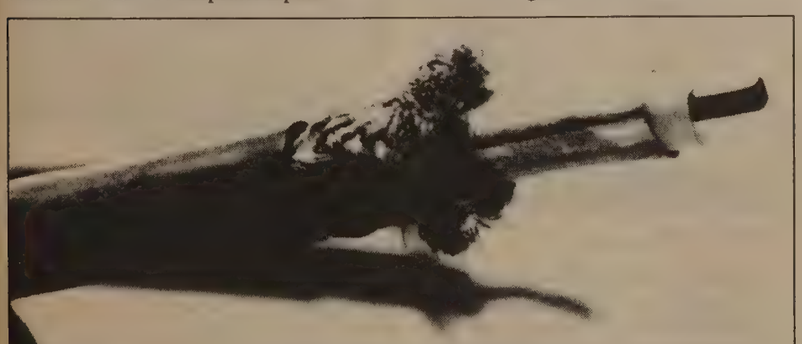

Photo B. Semi-rigid hardline (Belden 9913 type) will help reduce feedline loss for improved tropo reception on 2 meter SSB and satellite frequencies.

Radio Fun flea market

Turn your old ham and computer gear into cash now. Sure, you can wait for a hamfest to try and dump it, but you know you'll get a far more realistic price if you have it out where 30,000 active ham potential buyers can see it, rather than the few hundred local hams who come by a flea market table. Check your attic, garage, cellar, and closet shelves and get cash for your ham and computer gear before it's too old to sell. You know you're not going to use it again, so why leave it for your widow to throw out? That stuff isn't getting any younger!

The *Radio Fun Flea Market* costs you peanuts (almost)—comes to 25 cents a word for individual (non-commercial) ads, and 80 cents a word for commercial ads. Don't plan on telling a long story. Use abbreviations, cram it in. But be honest. There are plenty of hams who love to fix things, so if it doesn't work, say so.

Make your list, count the words, including your call, address and phone number. Include a check or your credit card number and expiration. If you're placing a commercial ad, include an additional phone number, separate from your ad. This is a monthly magazine, not a daily newspaper, so figure a couple of months before the action starts; then be prepared. If you get too many calls, you priced it too low. If you don't get many calls, too high.

So get busy. Blow the dust off, check everything out, make sure it still works right, and maybe you can help make a ham newcomer or retired old-timer happy with that rig you're not using.

Send your ads and payment to *Radio Fun Flea Market*, Joyce Bocash, 70 Route 202 N, Peterborough NH 03458, and *get set for the phone calls.*

Personalized caps, T-shirts, mugs, mouse pads, license plates. Request free color brochure with designs. **Donovan Deily WA3B**, RD2 Box 2088A, Leesport PA 19533-9653. RF234

QRP TRANSMITTERS—3 watt kits and assembled models for 20m, 30m, or 40m. Easy, fun to build! 2 stamps for **"MILLIWATTER"** info. **TECHSONIC**, Plymouth PK-32F, Conshohocken, PA 19428. RF235

1995 Nationwide Hamfest List & News letter. $5 ppd. **"Hamfests '95"** Box 607, Hatboro, PA 19040. RF255

MAHLON LOOMIS, INVENTOR OF RADIO; by Thomas Appleby, (Copyright 1967). Second printing available from **JOHAN K.V. SVANHOLM,** N3RF, **SVANHOLM RESEARCH LABORATORIES,** P.O. Box 81, Washington DC 20044. Please send $25.00 donation with $5.00 for S&H. RF445

PRINTED CIRCUIT BOARDS for projects in *73, Ham Radio, QST, ARRL Handbook.* List, SASE. **FAR CIRCUITS,** 18N640 Field Ct., Dundee IL 60118. RF595

WANTED: BUY & SELL All types of Electron Tubes. Call (612)429-9397, Fax (612)429-0292. **C & N ELECTRONICS,** Harold Bramstedt, 6104 Egg Lake Road, Hugo MN 55038. RF620

QRPers: low BAND QRP transmitter plans, $1.00. EASY ASSEMBLEY! CAPULET, INC., **P.O. Box 86, Getzville NY 14068, (716) 691-04351** **RF795**

FREE HAM GOSPEL TRACTS, SASE, **N3FTT,** 5133 Gramercy,Clifton Heights PA 19018 RF960

activities calendar

Send your announcements to: Radio Fun Activities Calendar, 70 Route 202-N, Peterborough NH 03458. We'll print as many as space allows, on a "first come-first listed" basis.

APR 7-9
ATLANTA, GA The Ham Radio Foundation, Inc. will sponsor "Ham Radio '95," to benefit the Scottish Rite Children's Medical Center. The three-day event will be held at North Atlanta Trade Center, at Exit 38 I-85. Times: Fri., 1 PM-6 PM; Sat., 9 AM-5 PM; Sun., 8 AM-1 PM. Advance reg. must be postmarked by Mar. 24th; make checks payable to *Ham Radio Foundation, Inc., 4343 Shallowford Rd., E-6, Marietta GA 30062. Tel. (404) 518-7376; FAX (404) 642-9035.* There will also be a DXPO sponsored by the Southeastern DX Club.

APR 22
CHARLESTON, SC The Trident ARC will sponsor "Flowertown IV - Summer Hamfest/Computer Expo at the Charleston Exchange Club Fairgrounds, College Pk. Rd. & US-78, 0830-1430 hrs. Setup from 1400 Fri. Talk-in on 147.27(+). For advance tickets, call *Mat KE4BIG, (803) 851-1708.* Vendors, contact *Roy N4ARA, (803) 851-0600,* or *(803) 871-5914.* Address all inquiries to *Flowertown Hamfest, c/o TARC, P.O. Box 73, Summerville SC 29484.*

APR 23
PITTSFIELD, MA The Northern Berkshire ARC will hold its Spring Flea Market from 8 AM-2 PM at Taconic H.S. on Valentine Rd. Vendor setup at 7 AM. Talk-in on 146.91/R. VE Exams at 9:30 AM; walk-ins OK. Contact *Chuck Lowery NZ1Z, (413) 447-8377.*

APR 28-30
MANCHESTER, NH The New England Div. Convention will be held at the Center of NH Hotel and Conference Center. VE Exams. Forums. DXCC and WAS field QSL checking. Saturday night banquet. Wouff Hong. Talk-in on 146.850. Contact *North East Convention Assoc., P.O. Box 475, Goffstown, NH 03045.*

MAY 6
KLAMATH FALLS, OR The KENO ARC Hamfest will be held at the Nat'l Guard Armory, 2501 Shasta Way, 9 AM-3 PM. Setup 7 AM-9 AM. VE Exams. Dealer Sales. Flea Market. Talk-in on 146.85. Contact *KENO ARC, P.O. Box 653, Keno OR 97627.*
LEAGUE CITY, TX The Pearland ARC will hold its 8th annual Hamfest 8 AM-2 PM, at the League City Civic Center, 400 W. Walker. VE Exams. Talk-in on 147.22(+) and 146.52 simplex. Contact *PARC 95 Hamfest, P.O. Box 2654, Pearland TX 77588-2654.*

MAY 7
SELDEN, NY An Amateur Radio Auction will be held at Suffolk Comm. College. Sponsor: Radio Central ARC, Inc. Open to the public at 8:30 AM; vendors 7 AM. Talk-in on 145.15/4Z, 449.525/2A. No private sales. Contact *Radio Central ARC, Inc., P.O. Box 680, Miller Place NY 11764.*

MAY 12-13
SIOUX CITY, IA The Iowa State Convention/Hamboree 17, co-sponsored by the 3900 Club Inc., and the Sooland AR Assn., will be held at the Marina Inn, So. Sioux City NE. Reg. Fri. May 12th, at Noon; Sat., May 13th, at 7:30 AM. Exhibits. Flea Market. ARRL Forum. Seminars. Get Acquainted Dinner, Fri., May 12th at 1 PM. Banquet May 13th. Computer Dealers, Traders Tables. MARS. Talk-in on 146.31/.91. Contact *Chairman, Dick Pitner W0FZO, 2931 Pierce St., Sioux City IA 51104. Tel. (712) 258-1520.*

MAY 19-21
HOT SPRINGS, SD The 1995 Dakota Div. Ham Radio Convention, sponsored by Hot Springs ARC, will be held at Mueller Civic Center beginning at 8 AM Sat. and Sun. Reg. and Dealer Setup Fri. afternoon. Instate inquiries, *(605) 745-4140;* Out-of-State Inquiries, *1-800-325-6991.* VE Exams Fri., by pre-registration. Mail advance payments, w/SASE, to *Tim Anderson K0OR, 440 N 20th, Hot Springs SD 57747. Tel. (605) 745-6323, or (605) 745-K0OR.* Deadline is May 1st.

MAY 20
COLORADO SPRINGS, CO The Pikes Peak RAA Hamfest/Electronics Show will be held 8 AM-3 PM at Liberty H.S., 8720 Scarborough Dr., Exit 151 off I-25. Vendor Setup 8 AM-3 PM. Contact *Harvey Hunter WA3EIB, 1437 N. Chelton Rd., Colorado Springs CO 80909; (719) 597-8964. Internet: Steve Westby WB7VHR 74727.2357@COMPUSERVE.COM.* VE Exams at 9 AM. Talk-in on 146.97(-) or 146.52.
OGDEN, UT The Utah Hamfest and WSU Center for AeroSpace Tech. will host a Hamfest at Weber State Univ. Student Union Bldg., 8 AM-5 PM Dealers, seminars, swap meet, contests. To pre-register, contact *Utah Hamfest, Inc., c/o OARC, P.O. Box 3353, Ogden UT 84409.* Talk-in on 146.90/.30 and 146.52 simplex.
QUAKERTOWN, NJ The Cherryville Rptr. Assn. will host its annual HAMFEST at the Warren County NJ Fairgrounds on County Route 519, 8 AM-2 PM. Setup at 6 AM. Vendors contact *Keith Burt KF5FK, (908) 788-4080 before 10 PM; FAX (908) 526-4958.Packet@N2OCW.NJ.USA.NOAM.* VE Exams, pre-reg. required; Check-in 9 AM, Testing 10 AM. Bring original and copy of current license, two forms of ID, FCC Form 610, and a check for $5.90 made payable to *ARRL/VEC.* To sign up for testing, please call *Marty Grozinski, (908) 806-6944 before 11 PM.* Talk-in on the club rptr., 147.375(+), starting at 6 AM.

MAY 28
CANFIELD, OH The Twenty over Nine Radio Club will hold their 10th annual Hamfest/Computer Show at the Canfield Fairgrounds, Rt. 46, 8 AM-3 PM. Doors open at 8 AM. Setup at 6:30 AM. Mobile check-in and directions until 1 PM on 147.315(+), 443.225(+) or alt. 145.275(-). Contact *Don Stoddard N8LNE, 42 S. Whitney Ave., Youngstown OH 44509; (216) 793-7072;* or *Dave Mellott KE8KT, 2895 Penny Ln., Austintown OH 44515, (216) 793-0816.*

JUNE 3
LOVELAND, CO The Northern Colorado ARC will host Winter Superfest from 8 AM-3 PM at the Larimer County Fairgrounds, 700 Railroad Ave. VE Exams, commercial exhibits, computer and radio goodies, more. Reserve tables from *Jeanene Gage N0YHY, (303) 351-7327.* For info contact *Randy Long WB6AVV, (303) 226-1529.* Talk-in on 145.115(-), 100 Hz.

JUNE 4
SALINA, KS The Central Kansas ARC, Inc. will host a Hamfest at the Bicentennial Center Heritage Hall, 9 AM-3 PM. Flea Market. Commercial Vendors. YL and non-ham activities. Talk-in on 147.03(+). Contact *Dan Cook AA0TT, (913) 263-8540;* or by mail in care of *CKARC, P.O. Box 2493, Salina KS 67401-2493.*

SPECIAL EVENT STATIONS

APR 22-23
GREEN VALLEY, AZ The Green Valley (AZ) ARC will operate KC7MF from 1600 UTC Apr. 22nd-2300 UTC Apr. 23rd, at the Green Valley Titan Missile Museum. Operation will be on SSB: 3.860, 7.230, 14.250, 21.330, and 28.450 MHz. Local 2m FM Rptr. operation will be on 145.29 MHz. For a certificate send QSL and an 8" x 12" SASE to *GVARC, 601 N. La Canada Dr., Green Valley AZ 85614.*

MAY 13-14
LAS VEGAS, NV The Nevada QSO Party, sponsored by The Frontier ARS, will be held from 0000Z May 13th-0600Z May 14th. Operation will be on CW, SSB, RTTY, SSTV and Packet, 6m-160m. Contact *Jim Frye NW7O, 4120 Oakhill Ave., Las Vegas NV 89121-6319.* Mail entry logs by Jun. 15th, 1995.

MAY 20
GLEN BURNIE, MD The Bay Area ARS will operate W3QLP 1300 UTC-2000 UTC to commemorate the 151st Anniversary of the telegraph message, "What Hath God Wrought." CW: 7.125, 14.125, 21.125, and 28.125 MHz. A commemorative certificate will be offered. Send your QSL card or SWL description of the QSO, along with a 9" x 12" SASE to *Hal Camlin W3QLP, The Bay Area ARS, 7506 Jacqwill Ct., Glen Burnie MD 21061.*

MAY 20-21
ST. CHARLES, MO The St. Charles ARC will operate WB0HSI 1300Z-2100Z as part of the Lewis and Clark Rendezvous commemorating the departure of the Lewis and Clark Expedition on 21 May, 1804. Frequencies: 7.265, 14.265, 21.365, 28.465, 146.67, AO-13 Modes B and J, as propagation and QRM permit. For a certificate, send a 9" x 12" SASE to *St. Charles ARC, P.O. Box 1429, St. Charles MO 6332-1429.*

MAY 27
WALL TOWNSHIP, NJ The Ocean-Monmouth ARC will operate N2KUU 1600Z May 27th-1600Z May 28th to commemorate the Marconi Memorial Tower Site. CW will be up 10 kHz from the bottom of Novice subbands, and 10.145, 14.045, 18.080 MHz and the bottom of General 80-15m and Novice 10m Phone subbands. For a certificate, send a 9" x 12" SASE (or $1 US) to *N2KUU* at his callbook address.

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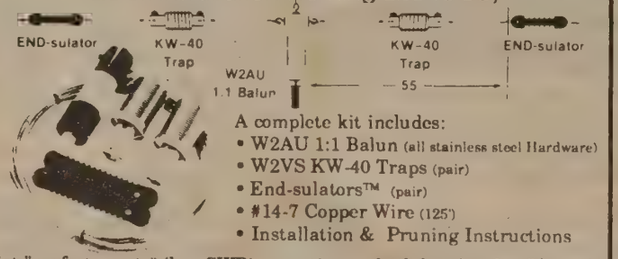

A complete kit includes:
- W2AU 1:1 Balun (all stainless steel Hardware)
- W2VS KW-40 Traps (pair)
- End-sulators™ (pair)
- #14-7 Copper Wire (125')
- Installation & Pruning Instructions

Get "perfect dipole" (low SWR) operation on both bands, plus "second resonance" operation on 10, 15 and 20 meters. Complete instructions results in a quick, accurate installation and pruning to low operating SWR.

Every component in the 40/80 meter kit is an old line, reliable UNADILLA product, time tested with hams for over 20 years.

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CIRCLE 136 ON READER SERVICE CARD

updates

QRP RF Wattmeter

Refer to the above mentioned article which appeared in the February 1995 issue of *Radio Fun.* On page 21, the Parts List should specify 4.7k resistors for R1 and R2.

Full-Wave Loop Antenna for 2m

With regard to the above mentioned article (*Radio Fun*, February 1995, page 6), the end of the sentence at the top of column 2 should read "an electrical length of two half wavelengths."

Uncle Wayne's Bookshelf

BOOKS FOR BEGINNERS

TAB4354 **The Beginner's Handbook of Amateur Radio, Third Edition** *by Clay Laster W5ZPV,* 395 pages. Wonderful book for newcomers. It is basic and well illustrated. Even if you have all the other ham handbooks, you'll still find this one useful. **$22.00**

W5GWNC **Technician Class License Manual: New No-Code** *by Gordon West* This book covers everything you need to become a Technician Class Ham. Every question and answer on the examinations is found in this one book. FCC Form 610 application. **$9.95**

XTAL-1 The Crystal Set Handbook *by Phil Anderson WØXI.* Want to give a kid an exciting present? Or maybe yourself? Crystal sets are alive and fun. Here's a whole book packed with crystal set circuits that anyone can build. Now start saving those oatmeal boxes, okay? 133 pages **$10.95**

AR4432 **W1FB's Help for New Hams** *by Doug DeMaw W1FB* Complete for the newcomer. Put together a station and get on the air. **$10.00**

WAYNE WRITES

WG1 **We The People *Declare War* On Our Lousy Government**—360p soft cover. This is Wayne's report explaining what the major problems are facing both New Hampshire and the country, and proposing simple, inexpensive solutions: a simple way to have government departments happily cut their expenses by 50% within three years; how to cut the cost of incarcerating prisoners by over 90%; how to end welfare; how to reduce the deficit; how to cut medical costs and improve health care; how to cut school costs and improve schools. An absolute steal at **$13.**

WG4 **20/20 Foresight**—Twenty 16p updates on the **Declare War** book—320p. Further proposals for solving critical American problems, such as a new approach to financing small businesses, how to finance Russia and other countries and make a profit doing it, the real dope on bioelectromagnetics, a new kind of polytechnical university, a new electronics technology, why Africa is in such a mess, why Perot bombed, how to have tuition-free universities, a plan for making Congress turn honest, etc. Plenty more. Ridiculously priced at **$10**.

WG5 **Submarine Life in WWII**—60p. Wayne's story of his adventures on the USS Drum SS-228 on five war patrols in the Pacific in 1943-45. What's it really like on a submarine when you're being depth charged? And what's the day-to-day life on a submarine like? Did you see the movie Das Boot? Exciting stuff and only **$7.50**.

WG6 **Uncle Wayne's Caribbean Adventures**—96p. Wayne's adventures scuba diving all around the Caribbean, visiting ham operators, and sightseeing. If you're interested in how to travel economically, you'll get some great ideas from this. He starts out with his "Diving, the Wimp Sport." You'll love the visits to 11 islands in 21 days trip. A measily **$7.50**.

WG7 **Uncle Wayne's Travels**—52p. Wayne travels to Russia, London, Aspen, St. Pierre, Munich, Vienna, Krakow, and Prague without it costing nearly as much as you might think. Cheap for you too, at **$5.00**.

CODE TAPES

73T06 **"The Stickler"** $5.95
6+ wpm—This is the practice tape for the Novice and Technician licenses. It is comprised of one solid hour of code. Characters are set at 13 wpm and spaced at 5 wpm.

73T13 **"Back Breaker"** $5.95
13+ wpm—Code groups again, at a brisk 13+ wpm so you'll be really at ease when you sit down in front of a steely-eyed volunteer examiner who starts sending you plain language code at only 13 per.

73T20 **"Courageous"** $5.95
20+ wpm Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the Extra Class license. We send the code faster than 20 per.

73T25 **"The Mind Boggler"** $5.95
25+wpm Fiendishly generated by kindly old Uncle Wayne for hams with a strong need for self punishment. Once you've conquered 25 per let Unk know if you need a 50 wpm tape.

ARRL BOOKS

AR1995 **ARRL 1995 Handbook (71st Ed.)** Features: added DSP, improved treatment of Pi and Pi-L, all new all-digital-logic, plus lots more. **$30.00**

AR1086-4 **ARRL Operating Manual (4th Ed.)** Information on how to make the best use of your station, including: interfacing home computers, OSCAR, VHF-UHF. **$18.00**

AR3657 **QRP Notebook** *by Dave DeMaw W1FB* Presents construction projects for the QRP operator. **$10.00**

AR3207 **W1FB's Design Notebook** *by Dave DeMaw W1FB* Filled with simple practical projects that can be built using readily available components and common hand tools. **$10.00**

AR0402 **Solid State Design** Good, basic information, circuit designs and applications; descriptions of receivers, transmitters, power supplies, and test equipment. **$12.00**

AR4173 **Now You're Talking! All You Need To Get Your First Ham Radio License (2nd Edition)** A complete study guide for the Technician and Novice written exam. Practical information every beginner needs is written clearly and simply and in small doses. **$19.00**

AR4718 **ARRL Repeater Directory 1994-1995** 19,000+ listings with digipeaters, bandplans, CTCSS (PL(TM)) tone chart, frequency coordinators, ARRL special service clubs, and beacon listings from 14 MHz to 24 GHz. **$6.00**

AR3398 **The DXCC Companion** *by Jim Kearman KR1S* Spells out in simple, straightforward terms what you need to be a successful DXer. **$8.00**

AR1250 **Log Book**—Spiral **$3.50**

AR3177 **The ARRL Spread Spectrum Source Book.** From a deceptively simple beginning, a group of experimenters set out to develop first theoretical and later practical systems for spread spectrum communications. This book consists of articles, papers and government reports that document the process whereby amateur spread spectrum progressed from the drawing board to the airwaves. **$20.00**

AR2960 **Transmission Line Transformers (2nd Ed.)** *by Dr. Jerry Sevick W2FM1* Practical designs and specific information on construction techniques and sources of material. **$20.00**

AR3851 **Hints and Kinks** Ideas for setting up your gear for comfortable, efficient operation. **$10.00**

ARRL **License Manuals** Complete FCC question pools with answers.

AR4181 **Technician Class**	$ 6.00
AR4688 **General Class**	$12.00
AR3274 **Advanced Class**	$ 8.00
AR3282 **Extra Class**	$ 8.00

AR3185 **The Satellite Experimenter's Handbook, (2nd Ed.)** *by Martin Davidoff K2UBC* Expanded and revised. Focusing on satellites built by and for the international radio amateur community. **$20.00**

AR2030 **Your Gateway to Packet Radio (2nd Ed.)** Tells everything you need to know about this popular new mode. **$12.00**

AR4645 **Satellite Anthology** The latest information on OSCARs 9 through 13 as well as the RS satellites, the use of digital modes, tracking antennas, RUDAK, microcomputer, and more! **$10.00**

AR4483 **Weather Satellite Handbook (4th Ed.)** *by Dr. Ralph Taggart WA8DQT* Expanded and revised to reflect today's weather-fax satellite technology. **$20.00**

AR4653 **Companion Software for Weather Satellite Handbook** 5 1/4" MS-DOS Floppy. **$10.00**

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REFERENCE

RS-1 **The Amateur Radio Mail Order Catalog and Resource Directory, 4th Edition** is the most comprehensive source book for electronic parts, software, and equipment targeted at the radio amateur or serious electronic hobbyist anywhere! Plus a wealth of "value-added" reference material all in 262 pages. 4th Edition clearance at only **$8.95**. (was $16.00)

TAB2701 **Transmitter Hunting** *by Joseph Moell and Thomas Curlee* Radio direction finding simplified. **$19.95**

UE202 **RTTY Today** *by Dave Ingram* Modern guide to amateur radioteletype. **$8.95**

TP002 **The World Ham Net Directory** *by Mike Witkowski* New—2nd edition. Introduces the special interest ham radio networks and shows you when and where you can tune them in. **$9.50**

WGP87158 **1995 North American Callbook** The 1995 North American Callbook lists the calls, names, and address information for 500,000+ licensed radio amateurs in all countries of North America. **$35.00**

MMH24 **Radio Handbook, 23rd Ed.** *by William I. Orr W6SAI* 840 pages of everything you wanted to know about radio communication. **$39.95**

WGP1234 **1995 International Callbook** The new 1995 International Callbook lists 500,000+ licensed radio amateurs in the countries outside North America. It covers South America, Europe, Africa, Asia, and the Pacific area (exclusive of Hawaii and the U.S. possessions). **$35.00**

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DOV76 **Second Level Basic Electronics** *Prepared by the Bureau of Naval Personnel* Sequel to Basic Electronics, thorough treatment of the more advanced levels of applied electronics. **$9.95**

20N096 **How To Read Schematics (4th Ed.)** *by Donald E. Herrington* Written for the beginner in electronics, but it also contains information valuable to the hobbyist and engineering technician. **$19.95**

WLSWOCP **Radio Operator's World Atlas** *by Walt Stinson, W0CP* This is a compact (5x7), detailed, and comprehensive world atlas designed to be a constant desk top companion for radio operators. **$17.95**

TAB37109 **Secrets of RF Circuit Design** *by Joseph J. Carr* Written in clear non-technical language, covers everything from antennas to transistors. **$21.95**

SOFTWARE

GGTE Morse Tutor From beginner to Extra Class. Code from 1 to over 100 words per minute. Standard or Farnsworth mode. Create your own drills. Exams conform to FCC requirements. 5 1/4" floppy for IBM PC, XT, AT, PS/2 or compatibles.

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ANTENNAS

AR4114 **Low Profile Amateur Radio** For the Ham who lives where antennas are frowned upon. From hiding your antenna to operating with low power. This books tells you how to get on the air using these tehniques, and others,without calling attention to yourself. **$8.00**

UE220 **The Easy Wire Antenna Handbook** *by Dave Ingram K4TWJ.* All of the needed dimensions for a full range of easy to build and erect "sky wires." **$9.95**

WGP87034 **All About Cubical Quad Antennas** *by William Orr and Stuart Cowan* "The Classic" on Quad design, theory, construction, operation. New feed and matching systems. New data. **$11.95**

TAB 3270P **Practical Antenna Handbook**—Second Edition, 1994, Joseph Carr, Tab Books. This 560-page book is a real treasure. Sarts with the fundamentals of antenna and feedline theory, explains about propagation of all kinds, and then provides a ton of easy antenna construction projects. Covers antennas and feeders for all bands. The explanations are simple and well illustrated, with some math, where it's unavoidable, but it won't bog you down. It even has the ZL-Special antenna, which I've used on 20m with some spectacular DXing success. A low angle of radiation and made it so I could always work the rare stuff first . . . Wayne. **$26.95.**

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AR2618 **W1FB's Antenna Notebook** *by Dave DeMaw W1FB* Get the best performance out of unobtrusive wire antennas and verticals. Build tuners and SWR bridges. **$10.00**

WGP87107 **All About Vertical Antennas***by William Orr* Comprehensive coverage of amateur communications. **$11.95**

WGP87042 **Beam Antenna Handbook** *by William Orr and Stuart Cowan* Everything you need to know about beam design, construction, and operation. **$11.95**

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AR2200 **Antenna Impedance Matching** *by Wilfred N. Caron* Most comprehensive book written on using Smith Charts in solving impedance matching problems. **$20.00**

AR0410 **Yagi Antenna Design** A *Ham Radio* series polished and expanded by Dr. Lawson. **$15.00**

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UHF/VHF PACKET

ARTSCI **U.S.Repeater Mapbook** *by Robert Martin* The Guide for traveling radio amateurs. **$9.95**

TP001 **The Basic Guide to VHF/UHF Ham Radio** *by Edward M. Noll* Provides a first rate introduction to the 2.6 and 1.25 meter bands as well as 23, 33, and 70cm. **$6.95**

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LAST CHANCE

ONLY A FEW LEFT

PC5066 **Digital Logic Gates and Flip-Flops** *by Ian R. Sinclair* A firm foundation in digital electronics. Treats the topics of gates and flip-flops thoroughly from the beginning. **$18.00**

PC5113 **Electronic Test Equipment Handbook** *by Steve Money* A guide to electronic test equipment for the engineer, technician, student and home enthusiast. **$18.00**

PC5007 **Practical Digital Electronics Handbook** *by Mike Tooley BA* Contains nine digital test gear projects. Digital circuits, logic gates, bistables and timers, microporcessors, memory and input/output devices. **$14.50**

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"SEEK YOU" by The Ham Band—The titles include "Always on the air", "On the Monday Evening Grayline", "Radio Widow", "The Trip to Dayton", "The Contest" and seven more. Ham radio CD includes experiences that radio hams go through. This is an extremely entertaining CD and will strike a chord with any radio ham, SWL or XYL—an ideal present! **SYCD $15 SYTAPE $10.**

IB8657 **Dumbing Us Down: The Hidden Curriculum Of Compulsory Schooling.** *by John Gatto* If you enjoyed "Declare War", you'll enjoy this also. A Wayne Green recommended reading. **$9.95.**

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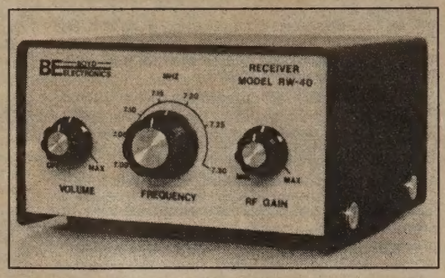
new products

BOYD ELECTRONICS



Boyd's new RW Series receivers offer an excellent means of setting up a low cost station for QRP operation on 20, 30, 40, and 80 meters.

True superheterodyne direct conversion receivers, they provide excellent frequency stability, with no drift during operation.

The single circuit board features the NE602 mixer IC, popular among amateur receiver builders. An easily adjustable two-stage input preselect filter reduces out-of-band and harmonically related signals, and with an approximate 0.1uV sensitivity, even the weakest CW, SSB, and AM signals can be heard. An input RF GAIN control following this filter reduces overloading from strong nearby stations.

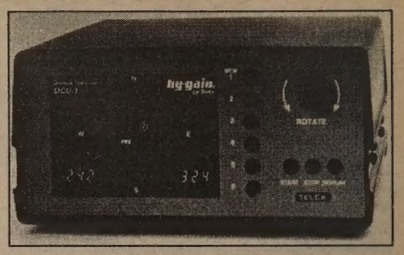
A six-pole audio bandpass filter with a low frequency cutoff of 250 Hz and high frequency cutoff of 2 kHz reduces hum and low frequency noise, and provides good station separation. The LM380 audio amplifier IC assures excellent audio quality and up to 2.5 watts of audio power when used with an 18V power supply.

The receiver oscillator is isolated by a buffer amplifier and provides external counter for monitoring the receiver's frequency.

The circuit board and front panel adhesive decal are designed to be used with the Radio Shack 270-253 cabinet. Cabinet, power supply adapter, knobs, power switch, connectors, and hardware are not supplied but are available from Radio Shack.

For more information, contact *Boyd Electronics Co., 1998 Southgate Way, Grants Pass, OR 97526; (503) 476-9583.* Or circle Reader Service No. 201.

TELEX COMMUNICATIONS



Telex introduces the DCU-1 Pathfinder, a state-of-the-art Digital Control Unit for Hy-Gain antenna rotators. Designed to be used with the Ham IV and T2X Tailtwister, it is also backwards compatible with any 8-wire Hy-Gain rotator, such as the Ham II or Ham III.

Featuring digital bearing readouts to 1 degree, motor slowdown and eight-second automatic brake delay, it also offers automatic calibration and selectable center of rotation.

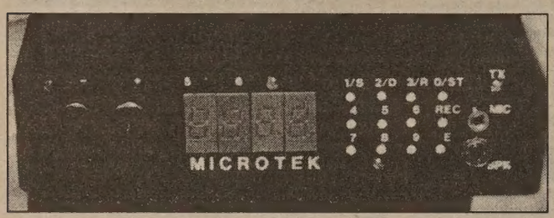
Six programmable memory presets let you program favorite beam headings, highly desirable for contesting, DXing, and VHF/UHF work. You can easily re-set the memories at any time.

RS-232 compatibility allows rotator control from your computer, and a serial pass-through capability lets you connect your radio, terminal TNC, modem, etc., to this serial port. A 60-line BASIC control program comes with the manual, and a free information package for software developers is available from the factory.

The DCU-1 and rotator are available in both 110VAC and 220VAC versions, operating on 50/60 Hz.

Suggested retail price for the T2X (DCU-1 and T2X Tailtwister) is $799.99, for the Ham IV-D (DCU-1 and Ham IV) $749.99, and the DCU-1 by itself is $519.60. Interested amateurs should contact their favorite Hy-Gain dealer for price and availability information.

For more information contact *Telex Communications, Inc., PO Box 5579, Lincoln, NE 68505; (402) 467-5321, FAX (402) 467-3279.* Or circle Reader Service No. 203.



MICROTEK

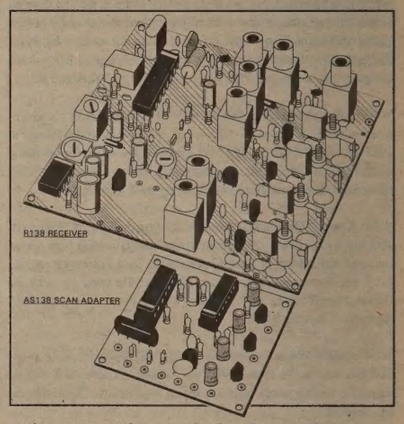
Ever wish your Ramsey FX146 2 meter radio had some commercial-rig-style bells 'n' whistles? Well, with the RC2 Radio Controller add-on from Microtek, it will.

It'll have a 12-button keypad, 7-segment LED display, 20-channel memory, fast scanning (100ms/channel), direct entry of any frequency from 140.000 to 179.995 MHz, and the ability to set standard repeater offset with the push of a button.

The RC2 comes with a 68HC11 microcontroller board that plugs into the radio's PLL socket, a display board that houses the display, keypad, status LEDs, and a new front panel. The only wiring needed is +12V, GND, CD (carrier detect), and PTT, all of which are easily tapped off the radio. The RC2 uses the radio's original volume and squelch controls, and mike and speaker jacks. The main board and display board connect via a 26-conductor ribbon cable, and everything is designed to fit into the original case.

The price is $110 plus $4 S&H (VA residents add sales tax). For more information, contact *Microtek, RR3 Box 4361, Bumpass, VA 23024; (703) 872-7020.* Or circle Reader Service No. 205.

HAMTRONICS



It is well known that Hamtronics, Inc. makes a very effective wideband FM receiver module for 137 MHz weather fax reception. The new R138 Receiver now has a companion accessory, the AS138 Scan Adapter Module.

The crystal controlled R138 Receiver has four channel oscillators. You select a particular satellite simply by grounding the desired control line with an external switch. Crystals, available for all the common satellites, simply plug into sockets on the board.

The new AS138 Scan Adapter lets you monitor the various weather satellites while you're away from the shack. Consisting of a small PC board, it continually monitors the receiver, scanning the four channels. If it hears an active satellite overhead, the scanner stops on that channel and turns on a relay. The relay can be used to activate a tape recorder, letting you play back the tape into your demodulator unit whenever you have the time to reproduce the satellite images on your computer.

At only $129, the R138 Receiver kit is quite a bargain. It is also available wired and tested for $189. The AS138 Scan Adapter Module is $39 in kit form, $69 wired and tested. Channel crystals are only $12 each, making this channelized approach much less expensive than synthesized receivers, even if you need to buy several crystals for the satellites you want to hear. And you'll get a lot of satisfaction doing the assembly yourself.

For more details, contact *Hamtronics, Inc., 65-F Mould Rd., Hilton, NY 14468-9535; (716) 392-9430, FAX (716) 392-9420.* Or circle Reader Service No. 206. Please tell them where you saw this announcement. You will receive a complete data sheet, including preamps and helical resonator filters for the 137 MHz band. They also have copies of the *Weather Satellite Handboook.*

JPS COMMUNICATIONS

From JPS Communications, Inc. comes the new ANC-4 Antenna Noise Canceller. Installed at your receiver/transceiver's antenna connector, this RF device cancels locally generated noise (power line noise, computer/TV noise, electrical noise from local machinery, etc.) from signals received by a primary antenna.

By removing the noise before it gets into the receiver and affects the receiver's AGC circuits, it allows reception of signals well below the noise level induced by the interference.

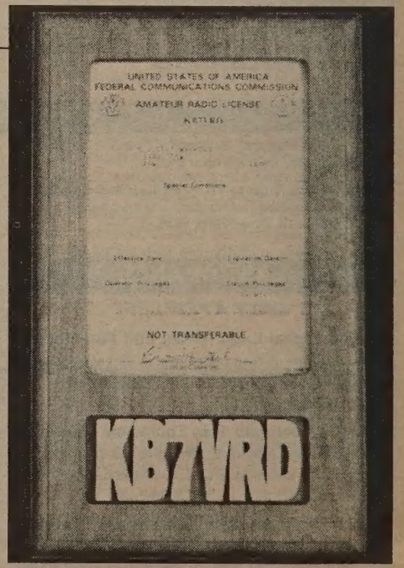
It works by detecting the local interference signal, matching its amplitude but reversing its phase, thereby cancelling the interference. Front panel controls provide phase and amplitude adjustment, for extremely deep cancellation of the offending signal.

The unit works with any receiver/transceiver with up to 150W PEP output power. A built-in RF detector automatically bypasses the unit whenever transmit RF is detected. (For use with a high power linear amplifier, the unit must be installed at the lower RF level of the transceiver, if transmitting is anticipated.)

The ANC-4 connects between the main station antenna and the receiver/transceiver's antenna connector. A short wire antenna and a short collapsible whip are supplied with each unit to act as a noise pickup antenna. If no main station antenna is available, the ANC-4 can function as an active antenna by plugging the noise antenna (or a longer wire antenna) into the noise antenna jack and using the NOISE GAIN control to increase the antenna output. The unit requires 12VDC @ 300 mA. Adapters are available from JPS.

For more information, contact *JPS Communications, Inc., PO Box 97757, Raleigh, NC 27624-7757; (919) 790-1011, FAX (919) 790-1456.* Or circle Reader Service No. 202.

SHACK ATTACK



Display your amateur radio license in style, with this Callsign License Plaque. Handcrafted from alderwood and hand-finished with two coats of polyurethane gloss for a beautiful, natural appearance, this handsome dark wood plaque is a great way to meet FCC Section 97.3 station license requirements while enhancing the looks of your shack.

This 7.25" x 12" plaque includes a 5" x 7" clear Plexiglas cover for your license, cardboard backing, self-leveling picture hanger hardware, and—of course—your callsign inset below in large 2" pine letters.

The Callsign License Plaque is available for $19.95 plus $3.50 S&H. For more information, contact *Shack Attack, 1394 N 770 W, Dept. 49, Orem, UT 84057-5903; toll-free (800) 573-7388; E-mail: kb7vrd@aol.com.* Or circle Reader Service No. 204.

What You Missed in *73 Amateur Radio Today*

If you don't read the April issue of *73 Amateur Radio Today*, here is some of what you're missing:

• "A Practical Weather Satellite Receiving System, Part 2." Build your own weather satellite receiver! Part 1 discussed setting up a receiving system and showed you how to build the necessary decoder and antenna. In Part 2, author Angus Anderson ZR6UM tells you how to build the interface card, and discusses the software that lets you display the received weather facsimile images on your PC.

• Flip switches from afar with your hand-held transceiver! In "Build an Intelligent Relay" Bruce R. Knox N8LXS shows how to turn a tiny handful of parts into an intelligent microprocessor-based, remotely-controlled relay. Uses are limited only by your imagination.

• Built military-tough, the Yaesu FT-2500M is also a solid performer, says reviewer Breckinridge Smith K4CHE, adding that the rig can be modified for packet, radio direction finding (RDF), and Military Affiliate Radio System (MARS) operation.

• Gordon West WB6NOA takes the GAP Voyager DX for a shakedown cruise. Does this impressive looking vertical outclass your average horizontal dipole? "Gordo" knows!

• Ever wrestled with antennas on towers? Save your strength, your nerves, and your sanity. Frank DiStefano WB2DZF shows you how to build "The Antenna Elevator." Winch your "skyhook" up and down with ease!

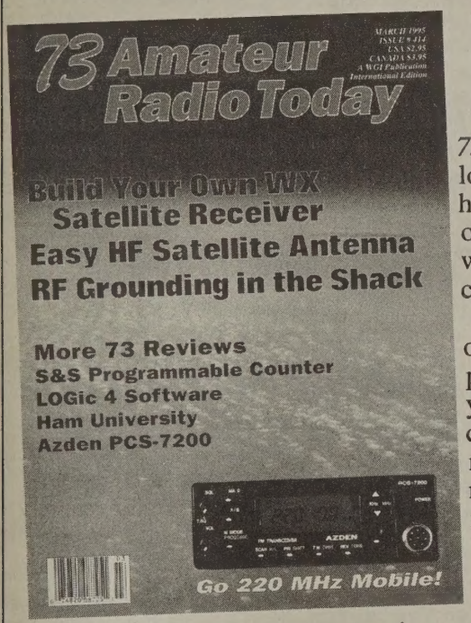
• Listen to the action on 160 meters with the "Specialized Top-Band DX Receiving Loop." Richard Marris G2BZQ has put together a cool-looking homebrew loop antenna. You can, too!

• Speaking of antennas, Frank Kamp K5DKZ shows you how to "Build an Efficient HF Mobile Antenna" that offers fine all-band performance at a cost we cheap-o hams can appreciate.

• Lacking a low-band receiver? If you've got a scanner, you can listen to the HF bands by building "A Shortwave Converter for Your Scanner." It's not hard to do. Steve Donnell WA1KYL shows you how.

• You've also missed our regular monthly columns on radio direction finding, radioteletype, VHF/UHF/microwave, low power (QRP), questions and answers, hints, and more.

You should read the April issue, and *every* issue of ***73 Amateur Radio Today!*** Order now and save $15 off the cover price. You'll receive a one-year subscription (12 issues in all) to the best ham magazine money can buy, for just $19.97. For instant service call toll-free (800)677-8838. Do it now! RF



What Does It Take

...to get you to subscribe to *73?* Sure, we could give you a lot of history to show how *73* has had a powerful influence on ham radio as it is today. But what you want to know is what can *73* do for you right now.

1) One of the most fun parts of hamming is buying a new piece of gear and using it. But you sure want to know all you can about it before buying, right? *73* has more equipment reviews than any other ham rag, and almost always has 'em first.

2) Unless you're a real nerd, you want to know how to get active on packet, the ham satellites, slow-scan, and all the other exciting adventures amateur radio has waiting for you. *73* has been the leader in new ham modes ever since it started. And Wayne was doing the same thing when he started *Amateur Radio Frontiers* magazine in 1951. He was pushing ham teletype then. Still is, for that matter. Then, as the editor of *CQ* for five years, he pushed SSB and NFM. Then, after being fired because *CQ* owed him too much money, he started *73,* where his long editorials have been urging hams to try new things, learn more, and be entrepreneurs, since 1960. Wayne's editorials have helped hundreds of hams become millionaires.

3) One of the more fun things in hamming is building gadgets. *73* has more simple construction projects than the other ham rags combined. Plus lots of reviews of kits. You'll have a ball with some of the QRP rigs and kits.

4) Antennas? You'll read about a ton of new ideas in antennas. Here's one area of hamming that you can experiment with and have fun.

5) Wayne's done just about everything there is to do in hamming, and he generally helped pioneer new modes. He's visited over 130 countries and operated from over half of them. He went on his first DXpedition in 1958 to Navassa as KC4AF. Almost got killed. So when he writes his editorials urging you to try something new, he's usually done it himself.

6) Once you start reading his editorials you'll be hounding the flea markets for back issues. With over a thousand of his provocative, and often controversial, editorials published so far, that'll keep you busy for a while. Wayne sure says what he thinks. But he does his homework first, so the chances are that if you don't agree with him, it may be you who needs to do the homework, not him. Wayne predicted the cellular telephone industry before it happened. He did the same with microcomputers, starting the first magazine in the field, and then with compact discs, again with a magazine. He's into cold fusion now with a new magazine. It costs $98 a year for a subscription, so you'll probably cry poverty and miss the next huge industry that's about to get started, and miss out on being a millionaire again. Tsk. But that's the price for being chintzy.

7) Speaking of chintzy, you might enjoy reading about Wayne's travels. He calls it being thrifty. He's written several of these travelogs with the day-to-day stories of his trips. You'll enjoy them. Check the Uncle Wayne's Bookshelf ad for details. You could do worse than read his ***Declare War*** book too. Thousands of hams have read and enjoyed it.

8) Meanwhile, at least read *73* so you can keep up with what's happening.

- **More New Equipment Reviews**
- **More Construction Projects**
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Where Did "73" Come From?

How did hams get started using "73" as meaning "best regards?" It all seems to have started with the very first hams. Many of them had cut their teeth on the western land lines using Morse clickers. Out West a man's most prized possession was his Winchester 73 rifle, the "gun that opened the west." So it was natural for early telegraphers to "will their 73" at the end of messages. Soon they were just signing "73." And that's how come we hams got started using "73" and are still using it. CBers younger than their IQs, and obviously confused by numbers, sign with "sevens and threes."

Anyway, when I decided to start my own ham magazine in 1960, I looked for some term which was peculiar to hamming, and chose *73*. When I started the first microcomputer magazine I went the same route, picking *Byte* for my title.

So here we are in 1995, 35 years after I started *73*, and we're still going strong. This October will mark the 35th anniversary of my first issue. 420 issues! Not many magazines last that long. I got started in all this back in 1950, when I got interested in RTTY. The next thing I knew I was doing a monthly *Amateur Radio Frontiers* magazine with 2000 paid subscribers, and then a column in *CQ* on the subject. When I got the *CQ* editor a better job at Popular Electronics in 1955 I suddenly found myself editing *CQ*. Five years later, after being fired, I decided to start my own ham magazine.

I couldn't find anyone willing to gamble with me, so I sold everything I could and got together just barely enough money to print the first issue. The saga of the next 35 years has been chronicled in my editorials. Well, I enjoyed John Campbell's (W2ZGU) editorials in *Analog* so much I decided to use the same approach. So I've been writing about anything I find of interest for 35 years, from aardvarks to B'ahai. The inventor of the contact lens was a ham I knew while I was living in Sarasota, and into B'ahai. Another Sarasota ham, who worked with me at WSPB, the local radio station, was Bandle Linn K8LAP, a cartoonist who did my first *73* cover and many more cartoons down through the years.

For more details on my life, you'll have to read my old editorials, or at least invest in some of the books and booklets I've written.

.....Wayne

Last Chance!

One of the most valuable resources you'll ever have in amateur radio is your ham magazine back issue collection. Any time you get interested in a new facet of the hobby, all you'll have to go on are the articles that have been published. This is why no ham ever throws out his old ham magazines. Ever!

Serendipitously, I was looking through our warehouse the other day and found that we had quite a bunch of back issues sitting there. They aren't of much use to us here, and they can be almost beyond value to you, so here's your opportunity to help me clean up a corner of the warehouse and for you to get a bunch of great back issues.

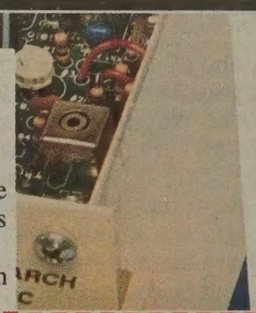
In addition to a gold mine of my old editorials, you'll also find reviews of equipment which could help you decide when you're shopping for a used rig. We publish more equipment reviews in *73* than any other ham rag. We also have more simple construction projects, and so on. I don't fill the magazine up with stale club news and the results of long-forgotten contests. Each issue of *73* is full of stuff still of current interest, even when the magazine is a few years old.

I've got 75 different back issues still on hand. While they last, you can stock up for a dollar each (each different, our choice), plus $5 for shipping and handling. $3 more if you prefer UPS. For $55 ppd. you can get a stack of 50 back issues, which will keep you busy for weeks just reading my editorials. For $35 ppd. I'll send you 25 back issues, and make you eat your heart out that you didn't send for the whole 75. By the time you find out that you've goofed and want to get the rest they'll be long gone. These are going to go fast.

No fair taking these to hamfests and selling them for $2 each. Tsk, have you no shame? Clubs should stock up on bundles of 25 to give as a prize to any new hams they get licensed, thus giving them a head start on their ham libraries.

I don't have a ton of these, so they won't last long!

.....Wayne



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